

IN THE UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF MICHIGAN  
SOUTHERN DIVISION

UNITED STATES OF AMERICA,

Plaintiff, No. 1:17cr130

vs.

DANIEL GISSANTANER,

Defendant.

Before:

THE HONORABLE JANET NEFF,  
U.S. District Judge  
Grand Rapids, Michigan  
Wednesday, May 23, 2018  
Motion Proceedings

APPEARANCES:

MR. ANDREW BIRGE, U.S. ATTORNEY  
By: MR. JUSTIN PRESANT  
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On behalf of the Plaintiff;

FEDERAL PUBLIC DEFENDERS  
By: MS. JOANNA CHRISTINE KLOET  
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On behalf of the Defendant.

REPORTED BY: MS. KATHY J. ANDERSON, RPR, FCRR

May 23, 2018

PROCEEDINGS, 9:09 a.m.

THE LAW CLERK: All rise. Court is now in session.  
Please be seated.

THE COURT: Good morning, everybody.

MS. KLOET: Good morning, Your Honor.

THE COURT: This is the date and time set for hearing  
on two motions, the government's motion to exclude defense  
witness Nathan Adams, and the defense motion to exclude DNA  
evidence in case number 1:17cr130, the United States of America  
versus Daniel Gissantaner.

Can we please have appearances and introductions.

MR. PRESANT: Good morning, Your Honor.  
Justin Presant for the United States. With me at counsel table  
is Stephanie Miller who is a paralegal in our office and will  
be assisting with the presentation of evidence today.

THE COURT: Thank you.

MS. KLOET: Good morning, Your Honor. Joanna Kloet,  
Assistant Public Defender. To my left is Pedro Celis, our  
research and writing attorney who has filed an appearance on  
this case, Helen Nieuwenhuis who has also filed an appearance,  
Mr. Gissantaner, Emily Seale is a paralegal that will be  
assisting with the presentation of exhibits, and investigator  
Carlos Clay.

THE COURT: Okay. A couple of housekeeping matters

1 before we begin. First of all, Mr. Presant, your voice is  
2 soft, and Ms. Kloet your voice is soft, and secondly, we are  
3 going to be dealing with some relatively technical issues, I  
4 think, throughout this hearing. So my request is, first of  
5 all, that you speak directly into the microphones so that the  
6 court reporter and I can hear you, and that you don't hurry  
7 your speech. And, Mr. Presant, you are particularly guilty of  
8 that. It's hard enough to, for her, for the court reporter to  
9 take down your comments, but when it involves technical terms  
10 and so forth, it's even more difficult. And I would echo that  
11 for any experts who are going to be testifying today. We are  
12 going to be dealing with an important issue here. I want to  
13 have as much clarity on the record as possible. And I will say  
14 this. Be prepared for interruptions because I'm going to have  
15 I think a lot of questions.

16 So let's start -- I think logically we should start  
17 with the government's motion regarding Mr. Adams. I have read  
18 your memos. I have read all of the transcripts that the  
19 government has provided, and I think this: The testimony of  
20 Mr. Adams is properly offered. The scope of it is another  
21 matter altogether. And it is, it is clear to me from the  
22 response filed by Ms. Kloet last night that Mr. Adams's  
23 testimony is going to be narrowly tailored to his educational  
24 and experience background, at least if I understood her memo  
25 correctly. So I am going to allow him to testify today.

1           The scope of his testimony, the scope of his expertise  
2           I think I am capable of understanding and properly applying.  
3           The government may disagree, and of course, Mr. Presant, you're  
4           more than free to put your objections on the record. But I am  
5           comfortable, again, after having, particularly having read the  
6           I think there were five or maybe six transcript excerpts which  
7           were offered, which were very interesting, actually, I'm  
8           comfortable allowing Ms. Kloet to put him on the stand and hear  
9           what he has to say. Okay.

10           MR. PRESANT: Your Honor, if I may. Just to be clear,  
11           the government was not seeking to exclude him from this hearing  
12           today. Just to limit his testimony to what he was properly  
13           qualified on. The government is seeking exclusion at trial,  
14           but I think the Court has to hear what his testimony is before  
15           it can rule on that.

16           THE COURT: I understand. And I think, you know, it  
17           is a little bit unusual to have this kind of an issue come up  
18           at this stage, but I do understand where you're coming from,  
19           Mr. Presant, and it's actually I think good to have the issue  
20           out in front of us early so that we have some idea what we're  
21           dealing with.

22           So that being solved at this point, let's move on to  
23           the defendant's motion to exclude DNA evidence. Ms. Kloet, the  
24           ball is in your court.

25           MS. KLOET: Your Honor, as we discussed this with

1 Attorney Present, and in light of the fact that the burden of  
2 proof is on the government, we have agreed that he would  
3 present his witnesses first. And I think in light of  
4 scheduling, that makes the most sense since people are coming  
5 from out of town.

6 THE COURT: Very well. What I would like you to start  
7 off with is a brief summary to put this issue in context. I've  
8 done some reading on the issues that are going to be presented,  
9 probabilistic genotyping, likelihood ratios and all of that.  
10 But what I know is that there is a potential, potentially broad  
11 range of topics within those designated areas, and so what I  
12 would like you to do, both of you, before we get to witnesses  
13 is to put this case in context in terms of what do you expect  
14 the issues to be surrounding the technical question of the DNA  
15 results that were reported in this case. I do think that we  
16 have, we can narrow this down so that at the point where a  
17 decision is necessary, it can be very focused in terms of what  
18 is or is not properly submitted to the jury, which is really  
19 our underlying goal here. What can we properly offer to the  
20 jury that is understandable, that is not prejudicial, and so  
21 forth. So let's start there. Give me a short -- as soon as I  
22 can find my legal pad to write on -- summary putting the case,  
23 putting the situation into context. Mr. Present.

24 MR. PRESENT: Thank you, Your Honor. Of course it's  
25 the defendant's motion so it's, the government agrees with

1 Ms. Kloet that the government should present witnesses first.  
2 But of course it's her arguments, and I don't know if the  
3 arguments have narrowed somewhat from the time of the initial  
4 motion. Maybe they have broadened a little bit in some  
5 respects. But I'll do my best to address the Court's concerns  
6 and then of course we will be happy to take any questions from  
7 the Court before we call our first witness.

8 The main issue in the government's view is the  
9 admissibility of DNA analysis predicated on or derived from,  
10 rather, STRmix which is software that was developed by the New  
11 Zealand and Australian governments and is currently the market  
12 leader in the United States in terms of probabilistic  
13 genotyping software used by federal, state and local  
14 laboratories in order to analyze DNA mixtures.

15 The defendant in his initial motion raised a number of  
16 challenges to the presentation of such DNA analysis. The  
17 challenges I think begin logically in the pipeline earlier even  
18 before we get to the probabilistic genotyping software. There  
19 are some passing critiques of polymerase chain reactions, the  
20 process of replicating DNA in order for it to be analyzed.  
21 Also the use of capillary electrophoresis which is the process  
22 by which DNA fragments are separated by the genetic analyzer.  
23 In the government's view those are not substantial challenges  
24 because the Court will hear testimony that that technology has  
25 been in use for many decades. There's nothing new about that

1 technology in particular and perhaps Ms. Kloet doesn't  
2 challenge that anymore.

3 But the next step in the pipeline we get to the use of  
4 the software after the DNA has been analyzed chemically. And  
5 what the software does is it uses probabilistic genotyping,  
6 which is a subspecialty of statistics; it's really advanced  
7 statistics applied to biology, bioinformatics, if you will, and  
8 even though STRmix is relatively new, and software programs  
9 like STRmix are relatively new, probabilistic genotyping is  
10 built on really established principles, statistical principles  
11 that have been around some of them for more than a century, and  
12 the Court will hear testimony about that too.

13 And so what the software does is it analyzes that in  
14 order to produce a likelihood ratio that can be used in court  
15 as evidence.

16 The government's view is that at the time of trial all  
17 we will really need is the Michigan State Police forensic  
18 scientist who did the work in this case to testify to what the  
19 likelihood ratio was after she did the analysis. And she will  
20 testify during the proceeding too about what she did to come up  
21 with that likelihood ratio.

22 Now, after the Daubert motion was filed the defendant  
23 raised an additional challenge to the code, the underlying  
24 code, that's used by the software. It's different in kind from  
25 the previous challenges in that the previous challenges were

1 directed more towards the use of probabilistic genotyping, the  
2 use of the software, the decisions that the analysts made that  
3 led to that final likelihood ratio. The new criticism is,  
4 well, the code was not, was not coded in the preferred style of  
5 the defense witness. The defense witness, Mr. Adams, does have  
6 some expertise in computer science, and he conducted a code  
7 review subsequent to the last time we were in court on this  
8 matter and he looked at some of the code and he has some  
9 criticisms of the way it was coded. In the government's view  
10 those are stylistic preferences. He doesn't, he's never really  
11 created software like this before, and at the end of the day  
12 the key for this Court and that the other courts that have  
13 reviewed STRmix have largely relied upon is the validation of  
14 the software. That before the software is used it is tested,  
15 and much like Your Honor or, well, I'll speak about myself,  
16 much like I don't understand how an internal combustion engine  
17 in a car works, I can tell you when I get in my car and I drive  
18 it it gets me where I need to go, I can use it properly, it  
19 works safely. And you're going to hear testimony about how  
20 STRmix was coded and the coding decisions that were made that  
21 respond substantively to Mr. Adams's criticism.

22 But I think at the end of the day the key is was this  
23 software tested properly before it was put into use, and if it  
24 was tested properly, which the Court will hear testimony that  
25 it was, you can be confident that it does what it is supposed



1 to do and that it functions properly in this case.

2 THE COURT: Do you also understand that there may be,  
3 or, it is possible that there may be a challenge to the  
4 protocols used by the Michigan State Police or whoever applied  
5 this STRmix software to the DNA samples in this case?

6 MR. PRESANT: Yes. The Court will hear testimony  
7 during this proceeding, and the government anticipates there  
8 would be testimony at trial, that STRmix is a big step forward  
9 in that it imposes uniformity on how probabilistic genotyping  
10 is done, but there inevitably it is a human exercise and so  
11 there is, there are human judgment calls that go into operating  
12 the software. There are things that the forensic scientists,  
13 Amber Smith in this case, had to do in order to use the  
14 software, and I think at trial those are properly subject to  
15 cross-examination. She will testify to those during this  
16 hearing. She will testify to those calls she made at trial.  
17 There's of course been an offer to rerun the software using  
18 different parameters if the defendant had different parameters  
19 that he wanted to input into the software; that request has not  
20 been made yet. But there will be testimony -- I believe  
21 Ms. Kloet is challenging that and there will be testimony on  
22 that issue.

23 The one final issue that I haven't touched on yet is  
24 the challenge to the use of likelihood ratios themselves,  
25 statistical measures. There are different types of statistics

1       that are used in DNA cases. Likelihood ratios have been used  
2       for more than a decade by the Michigan State Police or at least  
3       about a decade in paternity cases. Likelihood ratios are  
4       appropriate for particular reasons that the experts will  
5       testify to. And I know Ms. Kloet raises a challenge to the use  
6       of likelihood ratios at all as a statistic, and so I think that  
7       will be the other issue the Court has to decide.

8               THE COURT: My understanding with regard to that  
9       challenge has more to do with the number of potential  
10      contributors to the DNA sample. And the limited reading I have  
11      had an opportunity to do suggests that there is a real  
12      difference in how one applies or uses likelihood ratios where  
13      there is a single contributor of the DNA and where there are  
14      multiple contributors, such as in this case where there are  
15      three. So, again, I think we are going to need to be very  
16      specific and focused on exactly what we are talking about in  
17      this case, both for my benefit and ultimately for the jury's as  
18      well.

19             So is there anything else that you need to put this  
20      case in context from the government's perspective?

21             MR. PRESANT: I don't believe so, Your Honor. I think  
22      everything the Court said is absolutely correct, and the  
23      government is prepared for the Court to interrupt as much as it  
24      needs to because the goal of course is for you to get your  
25      questions answered. And I appreciate the opportunity to

1 present evidence to that.

2 THE COURT: Thank you, Mr. Presant. Ms. Kloet.

3 MS. KLOET: Thank you, Your Honor. I brought this  
4 motion I think there are, it can be distilled into two main  
5 arguments:

6 First of all, the reliability of the software is at  
7 issue here. There are two components to that: The  
8 subjectivity of the data that's entered by the analyst, and  
9 that includes as the Court referenced the estimation as to the  
10 number of contributors, allele calls, or whether you determine  
11 is not an allele. And as well as the parameters that are  
12 entered into the program and the parameters used and set by  
13 STRmix and similar systems themselves.

14 The testing and validation of these programs is also a  
15 critical issue. There has not been a broad universe of  
16 testing, broad enough universe of testing done on complex  
17 mixtures involving ostensibly three or more contributors to  
18 that mixture, assuming there are in fact three or more in that  
19 mixture.

20 The testing is also not done in accordance with  
21 generally accepted software testing principles. And it's  
22 important when you're dealing with a program that concededly  
23 doesn't generate the same answer every single time because  
24 you'll never know the ground truth, as referred to in the  
25 industry. And that testing is not sufficiently independent as

1 required by those software standards.

2 The second part of this motion, Your Honor, is the  
3 immense and disproportionate influence that this type of  
4 statistic is going to have on a juror, on a non mathematician,  
5 non science based, someone without a science background.

6 The obscurity surrounding the effective, this type of  
7 information and the effective communication of -- the  
8 difficulty in effectively communicating this type of  
9 information is demonstrated and has been noted by experts even  
10 within the federal government itself.

11 And the witnesses here today, Dr. Howenstine if she  
12 testifies, will be testifying to the elements of these points,  
13 including the subjectivity of the calls that are made by the  
14 analyst and where issues can arise there, including in the  
15 analytical process itself; Mr. Adams will testify to software  
16 as it applied to Probabilistic Genotyping Systems in this case  
17 and software standards with which he is familiar; and Dr. Lund  
18 will talk about issues in the communication of this type of  
19 information.

20 So that's what I anticipate covering today, Your  
21 Honor.

22 THE COURT: Thank you. Okay. Mr. Presant, let's hear  
23 it.

24 MR. PRESANT: Your Honor, just one evidentiary issue  
25 that relates to the government's first witness. The

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1 government's first witness is Dr. John Buckleton. He lives in  
2 New Zealand. The government anticipates he will be unavailable  
3 for trial, so if these issues do end up being relitigated at  
4 trial, the government will seek to admit his testimony from  
5 today's hearing under the Rules of Evidence. And I want to  
6 make sure that Ms. Kloet is on notice. We've previously  
7 discussed this, she's previously been advised of it, but I want  
8 to make sure that the record is clear so that the testimony can  
9 be developed appropriately from the defense perspective.

10 THE COURT: Very well.

11 MR. PRESANT: The government calls Dr. John Buckleton.

12 THE LAW CLERK: Please come forward over to the podium  
13 and turn toward me. You can set your materials down if you  
14 like.

15 JOHN BUCKLETON, GOVERNMENT WITNESS, WAS DULY SWORN

16 THE LAW CLERK: Please be seated. And state your full  
17 name for the record and any unusual spellings please spell  
18 those names.

19 THE WITNESS: My full name is John Simon Buckleton.

20 DIRECT EXAMINATION

21 BY MR. PRESANT:

22 Q Dr. Buckleton, where do you currently work?

23 A Largely in the United States, but the organization I work  
24 for is the New Zealand government. Mr. Presant, I have with me  
25 a typed glossary for the stenographer if that's any help, and I

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1 have four copies if you and the defense would like them.

2 MR. PRESANT: I appreciate that very much. We can  
3 distribute those now or later.

4 THE COURT: Good idea to do it now, I think.

5 THE WITNESS: There is two pages. You have to  
6 separate them.

7 BY MR. PRESANT:

8 Q Dr. Buckleton, you work for a particular institute within  
9 the New Zealand government, is that right?

10 A I work for ESR which is a Crown Research Institute.

11 Q What does that mean, what's a Crown Research Institute in  
12 New Zealand?

13 A A Crown Research Institute is a New Zealand government  
14 owned institute. However, we have the expectation to operate  
15 in a fiscally prudent manner.

16 Q Ms. Miller, can we bring up Government's Exhibit 1, please?

17 MR. PRESANT: Your Honor, would you prefer electronic  
18 presentation of evidence?

19 THE COURT: Yes.

20 MR. PRESANT: All right.

21 BY MR. PRESANT:

22 Q And Dr. Buckleton, you can refer to the book or the screen  
23 if you like. Do you recognize Exhibit 1?

24 A Yes.

25 Q What is it?

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1 A This is my curriculum vitae.

2 MR. PRESANT: Your Honor, the government moves to  
3 admit Exhibit 1.

4 THE COURT: Any objection?

5 MS. KLOET: No, Your Honor.

6 THE COURT: It's admitted.

7 BY MR. PRESANT:

8 Q Dr. Buckleton, I want to briefly go through your CV with  
9 you. Would you start for -- start by describing for the Court  
10 your academic background.

11 A I have a Ph.D. in chemistry from the University of  
12 Auckland, and DSc in forensic statistics. DSc is not a term  
13 familiar in the United States. It's a British Commonwealth  
14 term, and it's the highest academic qualification you can get  
15 in the British Commonwealth.

16 Q What about your employment record as it's listed here, what  
17 have you spent your career doing?

18 A From 1983 to the present, I have been employed in forensic  
19 science largely for the New Zealand government. However, I  
20 have had four periods of employment in the United Kingdom, and  
21 two periods in the United States.

22 Q What other positions have you held besides for the New  
23 Zealand government?

24 A Specifically referring to the United States, I was a  
25 researcher at North Carolina State University, then a visiting

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1 scholar at NIST, the National Institute of Science and  
2 Technology, and then a researcher at University of Washington  
3 at Seattle.

4 Q Has your experience in forensic science focused exclusively  
5 on DNA or have you worked in other forensic disciplines as  
6 well?

7 A I have worked across a range of disciplines, but more  
8 recently my world has narrowed almost exclusively to  
9 probabilistic genotyping.

10 Q How long have you been working in forensic DNA analysis of  
11 any kind?

12 A I was involved in forensic DNA analysis from the very  
13 inception of it in 1998 when it was first used in case work in  
14 the United Kingdom.

15 Q At the bottom of this first page of your CV it looks like  
16 you testified before in a number of cases.

17 A I have testified in nine Frye Daubert or Kelly Frye  
18 hearings in the United States, once in the Netherlands, once in  
19 Scotland, once in Australia on STRmix, and multiple times in  
20 Australia and New Zealand on a range of topics.

21 Q And regarding your prior testimony in the United States,  
22 those were all in state court, correct?

23 A No. Some were in county court, I believe. I have never --

24 Q Let me ask the question this way. Is this your first time  
25 testifying in federal court?



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1 A Yes.

2 Q Ms. Miller, can we go to page 2? What do we have here  
3 listed on page 2, Dr. Buckleton?

4 A I have listed some of the grants and major contracts that  
5 have been awarded to myself and others. So you can see three  
6 National Institute of Justice Research awards, and then I begin  
7 a list of paid plenaries and speaking engagements.

8 Q Page 4, please, Ms. Miller. I'm sorry, page 5. On page 5  
9 you begin a list of publications, is that right?

10 A Yes.

11 Q And that goes on for several pages.

12 A Yes.

13 Q It actually goes almost to the end of the CV, correct?

14 A Yes.

15 Q So I want to ask you about your experience analyzing DNA  
16 mixtures. When did you first begin analyzing mixtures?

17 A In the early 1990s.

18 Q And how did you do it back then?

19 A It was done with a likelihood ratio but the process was  
20 manual.

21 Q And when did you first begin to develop STRmix?

22 A STRmix has very deep roots, but more specifically, the  
23 software was begun in May 2011.

24 Q What was the reason to begin to develop the software, what  
25 was the origination of the idea?

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1 A There was a laboratory closure in Australia, and this led  
2 to a meeting of the senior managers of the Australasian  
3 laboratories. Australasia is a collective term for Australia  
4 and New Zealand. These managers were -- initiated a  
5 standardization project within Australasia and myself and Dr.  
6 Duncan Taylor were tasked with creating a software.

7 THE COURT: I'm going to interrupt here a minute,  
8 Mr. Presant. Dr. Buckleton, when you say that likelihood  
9 ratios were used in the early 1990s with a manual process,  
10 could you explain what you mean by that?

11 THE WITNESS: Yes, ma'am. Likelihood ratios have been  
12 used in forensic science since the 1940s, and in fact, even way  
13 back to the 1910s. Specifically answering your question, a  
14 likelihood ratio would be calculated for a mixture and the  
15 calculations would be done by hand, and a number of simplifying  
16 assumptions had to be made to do that, and we could  
17 realistically only do two-person mixtures at that stage.

18 THE COURT: Okay. Now, you're familiar to some extent  
19 with the American criminal justice system, right?

20 THE WITNESS: Yes, ma'am.

21 THE COURT: Okay. And it is not uncommon for a jury  
22 to be presented with a simple statement that says, the DNA  
23 analysis shows that it is a match for the defendant. Okay.  
24 What does that mean to you, and how is that different from this  
25 likelihood ratio?

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1 THE WITNESS: We have been encouraged away from that  
2 type of statement by such groups as the National Forensic  
3 Science Commission, now disbanded. That is a yes/no statement,  
4 and takes to the witness the task of determining certainty from  
5 probability.

6 I'm taught that such judgments should really be left  
7 to the factfinders, and I am trained to try and provide the  
8 factual and opinion evidence to enable a factfinder to make  
9 such a decision.

10 THE COURT: Well, if we tell the jury the defendant's  
11 DNA was found on the gun, just as an example, what does that  
12 mean to you as a forensic scientist in terms of how that  
13 communication was arrived at? Does it mean anything at all?

14 THE WITNESS: I think the United States Federal Bureau  
15 of Investigation have done source attribution statements which  
16 are what you're speaking to for a great many years and that is  
17 where they say that with certainty this DNA came from that  
18 person. Such a statement can still be made from a likelihood  
19 ratio if desired. In this particular case we wouldn't meet the  
20 federal limit of certainty. However, I understand the evidence  
21 is still very probative.

22 THE COURT: What is the federal limit of certainty?

23 THE WITNESS: I think it was a multiple of the  
24 population of the United States. I think it was something  
25 like, you know, I think it was ten times the population of the

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1 United States. But I can have that checked. There is a person  
2 who may know that in the court. I can check that at a break.

3 THE COURT: Okay. Thank you.

4 BY MR. PRESANT:

5 Q Thank you, Your Honor. Dr. Buckleton, what have your  
6 responsibilities been in rolling out STRmix to various  
7 laboratories that might be interested in using it?

8 A I'm one of the three developers of STRmix. And I have been  
9 responsible for training and support and development. During  
10 that time I have run of the order of 70, four-day training  
11 sessions in the United States for different groups around the  
12 United States, and I have worked with people on the setting of  
13 procedures and guidelines.

14 Q What's your and ESR's financial interest in STRmix?

15 A I have no personal financial interest in STRmix. I do not  
16 benefit from STRmix financially at all.

17 Q You're paid a salary?

18 A I'm on my New Zealand government salary. ESR takes some of  
19 but not all of the proceeds of STRmix, but it is not required  
20 to pay a dividend to anyone. Their money is used for its  
21 support work, development work, and, for instance, it's funding  
22 my court appearance here.

23 Q And you're appearing here today voluntarily, correct?

24 A Yes.

25 Q The government has covered, the United States government

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1 has covered some travel expenses but we are not paying you to  
2 be here, right?

3 A That's correct.

4 Q You have held positions with governing bodies, bodies that  
5 govern DNA analysis, correct?

6 A Yes.

7 Q What are those organizations?

8 A The primary organization in the United States and Canada is  
9 SWGDAM. That is an FBI sponsored group of North American  
10 scientists and invited guests, and they are the premier  
11 guideline setting organization for forensic DNA. I have also  
12 been involved in some others, but that is the primary one in  
13 the United States.

14 Q Well, let's start with SWGDAM which is the scientific  
15 working group for DNA analysis methods, correct?

16 A Yes.

17 Q What did you do for SWGDAM?

18 A I was on SWGDAM from 2013 to 2017 where I retired from it  
19 in the hope of relocating back to New Zealand. During that  
20 time I operated as a member of SWGDAM. With specific regard to  
21 probabilistic genotyping, I sat out on all those discussions to  
22 avoid the appearance of undue influence.

23 Q But otherwise you reviewed various issues with respect to  
24 DNA and you voted on them or you consulted on them?

25 A I'm not a voting member. There are votes given, for

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1 instance, the FBI has a large block of votes. I was not a  
2 voting member but I was involved in all the discussions and  
3 recommendations and drafting processes that were put to me.

4 Q You testified that you worked at NIST for some time period?

5 A Yes.

6 Q What time period was that?

7 A That was from October 2014 to December 2016.

8 Q What did you do at NIST?

9 A I was a visiting scholar, and my work there involved work  
10 on forensic evidence interpretation and in particular,  
11 footwear.

12 Q Have you worked --

13 THE COURT: What does that mean?

14 THE WITNESS: Footwear, shoe print work, Ma'am. I was  
15 deliberately staying away from DNA to again avoid the  
16 appearance of undue influence.

17 THE COURT: Thank you.

18 BY MR. PRESANT:

19 Q What about other organizations besides SWGDAM and NIST?

20 A The other organizations that are the primary guideline  
21 setting bodies that the United States tends to take cognizance  
22 of are the International Society of Forensic Geneticists, and I  
23 was on the DNA commission that wrote the probabilistic  
24 genotyping guidelines. OSAC, O-S-A-C, which is the  
25 Organization of Science Area Committees, which I was on until

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1 2017, and that has not made a work product in this field.  
2 PCAST, the President's Council of Advisors On Science and  
3 Technology, I'm not on that but I was invited for discussions  
4 with them on that.

5 Q What did you do for OSAC?

6 A I was on various committees, including the proposition  
7 setting document and the DNA subcommittee.

8 MR. PRESANT: Your Honor, at this time the government  
9 offers Dr. Buckleton as an expert in forensic DNA analysis,  
10 probabilistic genotyping, and software development.

11 THE COURT: Ms. Kloet, did you wish to voir dire  
12 Dr. Buckleton on his qualifications as an expert in those three  
13 fields?

14 MS. KLOET: The three fields, can you repeat the three  
15 fields?

16 MR. PRESANT: Forensic DNA analysis, probabilistic  
17 genotyping, software development.

18 MS. KLOET: I would like to ask a few questions.

19 THE COURT: Thank you.

20 MS. KLOET: Dr. Buckleton, your background or your  
21 education is not in computer science, correct?

22 THE WITNESS: Yes, it is.

23 MS. KLOET: Your formal education is not computer  
24 science, is it?

25 THE WITNESS: Some of it is.

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1 MS. KLOET: Do you have a degree in computer science?

2 THE WITNESS: I have undergraduate papers in it but  
3 not a major in it.

4 MS. KLOET: Okay.

5 THE COURT: What is your undergraduate degree in,  
6 Dr. Buckleton?

7 THE WITNESS: Chemistry, Ma'am.

8 THE COURT: That's your Ph.D. as well?

9 THE WITNESS: Yes.

10 THE COURT: Do you have a master's degree in something  
11 different?

12 THE WITNESS: Chemistry. Three degrees in chemistry.

13 THE COURT: Okay.

14 MS. KLOET: You didn't write the code in STRmix, did  
15 you?

16 THE WITNESS: No.

17 MS. KLOET: You don't write computer code.

18 THE WITNESS: I have.

19 MS. KLOET: Do you do that on a regular basis?

20 THE WITNESS: I haven't done that regularly since the  
21 mid-'90s.

22 THE COURT: Who did write the code in STRmix?

23 THE WITNESS: The version in question in this case was  
24 written almost totally by Dr. Duncan Taylor of Adelaide,  
25 Australia.



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1 THE COURT: T-A-Y-L-O-R?

2 THE WITNESS: Yes, ma'am. He's top of the glossary  
3 there as well.

4 MS. KLOET: You don't currently engage in forensic  
5 analysis.

6 THE WITNESS: Excuse me, my mind was elsewhere for a  
7 minute. What did you say?

8 MS. KLOET: That's okay. You don't currently engage  
9 in forensic analysis or wet work as it's sometimes called, do  
10 you?

11 THE WITNESS: No, I haven't been in a laboratory since  
12 '02.

13 MS. KLOET: Do you have a degree in statistics?

14 THE WITNESS: My DSc could be argued to be in  
15 statistics, and I take a position of professor of statistics on  
16 first of June this year.

17 MS. KLOET: Have you ever held a position as a  
18 professor of statistics before?

19 THE WITNESS: I have held a position as professor in  
20 statistics departments before.

21 MS. KLOET: Have you ever held -- or your degree is  
22 not in mathematics, is it?

23 THE WITNESS: I have a minor in mathematics and I'm  
24 reasonably strong in mathematics.

25 MS. KLOET: As I understand it, the government asked

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1 to qualify him in forensic DNA, Probabilistic Genotyping  
2 Systems, and computer software. I think to the extent to which  
3 he needs to clarify his statements or testify as to  
4 Probabilistic Genotyping Systems, I'm fine with him testifying  
5 as to the underlying forensic DNA principles and software  
6 principles. But I'm not comfortable qualifying him as an  
7 expert in computer science software.

8 THE COURT: Mr. Presant.

9 MR. PRESANT: Redirect or argument, Your Honor?

10 THE COURT: Redirect, please.

11 MR. PRESANT: Thank you, Your Honor.

12 BY MR. PRESANT:

13 Q Dr. Buckleton, would you tell the Court a little bit more  
14 about your role working with Dr. Taylor and the process of  
15 developing STRmix?

16 A Certainly. I think some of the comment is fair. My formal  
17 training in computer science was in the early '80s.

18 THE COURT: Were there computers back then?

19 THE WITNESS: Yes, ma'am, there were. But they were  
20 much bigger than they are now.

21 I have actually in the late '80s published a chapter  
22 in a book on artificial intelligence, and during my research  
23 career I have been involved in quite a number of computing  
24 projects. The genesis of probabilistic genotyping dates back  
25 to a mathematical solution I developed in 1999, so I'm actually

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1 the father of probabilistic genotyping. And the mathematics  
2 and the majority of modern probabilistic genotyping software  
3 either comes directly from me or dates back to work I've done.

4 My work with Dr. Taylor varied from side-by-side work  
5 on algorithms and testing to work vicariously across the Tasman  
6 Sea which separates Australia from New Zealand on the same  
7 subject. And initially we were the first two developers. It's  
8 much of the mathematics in the early version are mine, or mine  
9 and Dr. Taylor's combined.

10 Subsequently, we added a third developer, Dr. Jo-Anne  
11 Bright, who is very strong in quality systems, specifically in  
12 ISO 17025, which is the governing standard for most of forensic  
13 science.

14 BY MR. PRESANT:

15 Q And I believe your testimony was STRmix was first began to  
16 be developed in 2011, correct?

17 A 2011.

18 Q So that was seven years ago?

19 A Yes.

20 Q And over the past seven years, have you been continuously  
21 involved with Dr. Taylor and other individuals who have been  
22 doing the line-by-line coding?

23 A Yes.

24 Q And you've advised them on how to code for it?

25 A Yes. Algorithmic work, yes, coding.

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1 Q Is that still part of your responsibilities today to work  
2 with the people who are developing the software?

3 A Yes.

4 Q Now, Ms. Kloet also asked you questions about your  
5 experience doing work in a wet lab. You don't do that anymore,  
6 right?

7 A No.

8 Q What was your experience doing work in a wet lab generally,  
9 getting your Ph.D. in chemistry, and doing your other academic  
10 work in chemistry, and specifically, in forensic DNA analysis?

11 A I think Ms. Kloet is fair to suggest that my experience is  
12 almost ancient history now in the wet lab. However, my  
13 experience in the actual foibles of DNA analysis is completely  
14 current, and for instance, I wrote with two others the textbook  
15 on DNA interpretation.

16 Q But I guess with respect to the ancient work, you actually  
17 did used to work in a wet lab, right?

18 A Yes, I did.

19 Q So you've done --

20 A Thousands of cases.

21 Q -- DNA extractions?

22 A No. No. That tends to be split in science and technical  
23 work. So the actual extractions and running the robots tends  
24 to be done by technicians, and at that point in my career I  
25 wasn't that. So we tend to get the process, to the process

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1 post production of the e-gram, which is the electropherogram.

2 Q That's currently or even back when you were being trained  
3 academically in your early career?

4 A In my early career it was chemistry and it wasn't DNA.  
5 DNA, the advent of DNA was 1987, and my university days were in  
6 the '70s.

7 MR. PRESANT: Your Honor, at this time I would reoffer  
8 Dr. Buckleton in those three categories: Forensic DNA  
9 analysis, probabilistic genotyping, and also software  
10 development. Based on the experience he's testified to, I  
11 would also note that he's a fact witness here with respect to  
12 the development of the software because he was actually doing  
13 it.

14 THE COURT: I do accept Dr. Buckleton, and as I said  
15 earlier, I think that I can sort out areas where he's been  
16 quite candid. His expertise dates to the 1980s, but it does  
17 sound to me like it's very current, and he will be recognized  
18 as an expert in those areas.

19 MR. PRESANT: Thank you, Your Honor.

20 BY MR. PRESANT:

21 Q Dr. Buckleton, would you begin just by telling the Court --  
22 well, you've testified already to the initial reasons for  
23 developing STRmix. But would you tell the Court a little bit  
24 about the history of the development of the software from the  
25 very first version to where we are today?

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1 A The first versions of STRmix were never intended for  
2 release beyond Australasia. It was to be an in-house tool for  
3 the Australasia laboratories. And that applies to the whole  
4 1.0 series which goes from version 1.0 through to version 1.08.

5 At sometime in about 2012 various U.S. agencies,  
6 particularly the U.S. Army and Californian Department of  
7 Justice heard about this, and made representations to my  
8 management that eventually led to us releasing a version for  
9 United States use, in fact for international use. And that was  
10 in January 2014.

11 I was involved in the development of that and in  
12 training in the United States and internationally at that time.

13 The first release was the 2.0 series, and we actually  
14 skipped 2.1 and 2.2, and the next series is the 2.3 series,  
15 which is the version we are speaking of today.

16 MR. PRESANT: I'm sorry to interrupt you. But  
17 specifically the one at issue in this case is 2.3.07, correct?

18 THE WITNESS: Yes.

19 BY MR. PRESANT:

20 Q I'm sorry, continue.

21 A I have often described 2.3 as the version I always wished  
22 we had made if I had envisaged what it might be back in, for  
23 instance, the year 2000. This is what I wished we could have  
24 made.

25 And I was very proud of it and it contains a number of

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1 really solid features such as treatment of relatives, which I  
2 believe to be a very important matter.

3 The release of 2.3.07 actually predates many of the  
4 guidance documents, including SWGDAM. So we came out in  
5 October 2015, the SWGDAM guidelines came out in July 2015, so  
6 it post dates SWGDAM, but it predates the others.

7 The validation of 2.3.07 is done to the SWGDAM  
8 guidelines, which are the primary guidelines of which the  
9 United States takes cognizance. And I just remind you it's an  
10 FBI sponsored agency.

11 Subsequently we have either met or back, back  
12 engineered I guess so that we meet and exceed all the other  
13 guidelines, including now the PCAST guidelines. With the  
14 possible exception of some aspects of the new Forensic  
15 Regulator Guidelines.

16 BY MR. PRESANT:

17 Q So that was 2.3, the 2.3 series which is at issue in this  
18 case.

19 A Yes.

20 Q Where are we now, what version are you working on now?

21 A We are currently debugging 2.6.

22 Q What does that mean, debugging?

23 A Debugging is an iterative process of testing and coding  
24 where you run various trials, test the components for  
25 compliance, and if they fail compliance, diagnose the problem

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1 and rectify.

2 Q Well, I want to talk to you about some of that process in a  
3 little bit. But first I want to ask you is 2.6 going to be the  
4 last version of STRmix?

5 A No.

6 Q What -- when do you stop? When will you stop developing  
7 STRmix?

8 A The future is often opaque to me. However, sequencing is  
9 one of the next matters of great interest, so at the moment we  
10 don't use DNA sequencing, we use a different method called STR  
11 typing. Sequencing is likely to be the next phase, and people  
12 are also interested in the Y. chromosome. So I imagine we will  
13 be developing versions for those.

14 Q Is it unusual for software to be operational while  
15 development of new versions is still going on?

16 A Yes.

17 Q It is unusual?

18 A No, not unusual. Sorry. It's completely usual.  
19 Completely misspoke, I'm sorry.

20 Q Well, I just want to make sure.

21 A Absolutely normal. I mean that's why there are all  
22 different Microsoft versions.

23 Q And what about apps on your phone?

24 A Absolutely. Updates come all the time.

25 Q And that's kind of what the process is that you're in



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1 currently with STRmix, correct?

2 A Yes.

3 Q The fact that you're developing new versions mean that  
4 older versions didn't work?

5 A No. The engine of STRmix was in place very early, the core  
6 Metropolis-Hastings algorithm and the Monte Carlo Markov Chain  
7 was all in place very early, and has changed very little during  
8 that time.

9 Q Will you describe that for the Court, the way STRmix  
10 actually works that engine you're talking about; what is the  
11 Markov Chain Monte Carlo engine, how does probabilistic  
12 genotyping work, how does it get to that final likelihood  
13 ratio?

14 A Yes. Thank you. Markov was a Russian mathematician  
15 working on Russian poetry, and his particular interest was in  
16 whether the next letter would be a vowel or a consonant, and he  
17 published his work in 1906. I mention this to demonstrate this  
18 is not novel technology.

19 The Monte Carlo aspect is named for the Monte Carlo  
20 casino in Monaco and was a name used by the Los Alamos  
21 scientists during the development of the atomic bomb in the  
22 Second World War to describe the process. They had to conceal  
23 the true nature of what they were doing so they used the code  
24 Monte Carlo.

25 The Monte Carlo and Markov Chain processes were

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1 synergized in the '50s to '70s to become Monte Carlo Markov  
2 Chain and you're at liberty to say that backwards. You can say  
3 Markov Chain Monte Carlo with equal accuracy.

4 It has become a dominant and mainstream methodology  
5 for solving this type of complex problem from the '70s onwards,  
6 and is through many fields such as physics, engineering,  
7 geoscience, medicine, and a great many others.

8 It works roughly like a game of hot and cold where as  
9 children you may have taken a step and your parents said  
10 whether you were hotter or colder, and using that feedback you  
11 would try and find your way to whatever your goal was. And a  
12 Markov Chain is quite similar to this, and, as I said, it's  
13 very well established mathematics. This process is used to  
14 tease apart the mixed data and essentially make a list of  
15 plausible single source genotypes that may have contributed to  
16 that mixture.

17 STRmix is in two completely separate parts; the first  
18 part does what I've said, which is termed deconvoluting a  
19 mixture, the second part does the relatively trivial action of  
20 assembling the likelihood ratio.

21 BY MR. PRESANT:

22 Q So what are the inputs into the engine that does this work  
23 in the first step?

24 A The inputs into STRmix are a set of data that comes  
25 straight out of analysis of the electropherogram, often with

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1 GeneMaker or GeneMarker, which are two commercial softwares for  
2 processing e-grams.

3 Q Can I just interrupt you there? Ms. Miller, will you bring  
4 up Government's Exhibit 6, please? Now, Dr. Buckleton, you  
5 didn't review the data that was used in this particular case,  
6 correct?

7 A No.

8 Q I'll represent to you that this is one of the  
9 electropherograms that was generated by the Michigan State  
10 Police lab. My question for you is do you recognize it as an  
11 electropherogram?

12 A Yes.

13 Q Would it assist you in describing what electropherograms  
14 are to the Court and how they are input into STRmix?

15 A Yes, I think it would, thank you.

16 Q If there's a portion that you would like blown up, would  
17 you just, it's a touch screen, you can just highlight what you  
18 would like zoomed in on, and Ms. Miller will blow it up for the  
19 Court.

20 A Gosh, all this new tangled technology. Can I have the D3  
21 locus blown up, please? I have put a small black dot there.  
22 The data for STRmix consists of the set of allele names and  
23 peak heights. So if we look at D3, you'll see a small text box  
24 there with the numbers 14 then 118.84, then 2213.

25 Q That's right there that you're looking, correct?

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1 A Yes, it is. So the 14 is the allele name, so that is the  
2 14 allele at D3.

3 Q What's an allele?

4 A Technically a variant of a gene but we use it to mean a  
5 variant at a in this case noncoding region.

6 Q So D3 right here is the locus or the gene, right?

7 A Well, it's not a gene. That's why I'm making that somewhat  
8 pedantic distinction. Gene is a coding DNA and these aren't.

9 Q So it doesn't produce protein, right?

10 A It doesn't produce a protein. In fact D3 isn't even  
11 transcribed. So D3, the 3 means on chromosome 3, so the human  
12 chromosomes are numbered in decreasing size order, so  
13 chromosome 1 is the largest, 2, then 3. So this is D3. Then  
14 the number 1358 is simply a sequence number in which those loci  
15 were found. They are noncoding regions of DNA, sometimes  
16 incorrectly termed junk DNA. And because they don't code,  
17 humans can be very variable at them. We obviously cannot vary  
18 much in the important elements such as arms. It's selectively  
19 disadvantageous to not have two arms. However, here you can  
20 have almost anything you want and nothing bad happens.

21 So we see at the D3 locus a number of peaks, and the  
22 genotype software has detected peaks at 14, 15, 16, 17, and 18.  
23 The next number, 118.4 is the molecular weight of that allele.  
24 And that is used later in the mathematics. And then the 2213  
25 is the peak height of the 14 allele, and if you come down to

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1 the 15 allele, you can see it's 3848, therefore a little bit  
2 higher, and if you go up and look at the picture you can see  
3 that indeed the 15 is a little bit higher than the 14.

4 These are the data that are input into STRmix. I'll  
5 highlight the subjective elements of data processing at this  
6 point due to the indications earlier that that was of interest.

7 BY MR. PRESANT:

8 Q If I can just interrupt you to ask you a couple of  
9 clarifying questions. These alleles are sometimes referred to  
10 as short tandem repeats, right?

11 A Yes.

12 Q That's the STR in STRmix?

13 A Yes.

14 Q Are these numbers 14, 15 or 16 significant with respect to  
15 the number of repeats?

16 A Yes, those are the number of repeats.

17 THE COURT: Let me interrupt then again, Mr. Presant.  
18 Where do these numbers originate that are put into the STRmix  
19 software?

20 THE WITNESS: These numbers originate from the  
21 standard DNA typing process.

22 THE COURT: Which is the sample?

23 THE WITNESS: The sample is taken and extracted, it is  
24 then amplified using an amplification process that has often  
25 been likened to a molecular photocopier. So you take one copy

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1 of the DNA and copy it into two, then you copy those again into  
2 four, and we do this plausibly with Fusion 29 rounds of copying  
3 until we now have millions of copies of the DNA from which we  
4 started. That DNA has incorporated a fluorescent tag into it  
5 during this copying process, and it is synced down a capillary,  
6 and it's often likened to putting a platoon of soldiers through  
7 a swamp. The little light guys will get out the other side  
8 first and the big heavy guys will take a bit longer to get out.  
9 That's exactly what happens. The light fragments come off the  
10 column first, and then later the middle sized, and subsequently  
11 the big ones.

12 THE COURT: And this is what the technicians do that  
13 you described earlier, is that right?

14 THE WITNESS: Yes. My part of the process would  
15 usually start from the e-gram at which we are looking.

16 THE COURT: That somebody else produced.

17 THE WITNESS: That's correct.

18 THE COURT: And they would produce that -- you know,  
19 I really am trying to get, Dr. Buckleton, at the whole process  
20 from start to finish. The law enforcement collects something  
21 that they suspect may have DNA of a defendant or a proposed  
22 defendant on it. That object, whatever it is, in this case it  
23 was a gun, in other cases it may be fabric, whatever it is,  
24 then goes to a technician who does what with it to get to these  
25 numbers? This is the wet lab process?

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1 THE WITNESS: Yes.

2 THE COURT: Okay.

3 THE WITNESS: However it's very highly robotic now.  
4 So the, you know, the human element is quite small now. But  
5 the processes are extraction, and that takes the DNA off  
6 whatever it's on, so it probably was on a swab from the gun, I  
7 imagine.

8 THE COURT: Okay.

9 THE WITNESS: So a swab is almost like those things  
10 you might use to clean your ear. You swab the gun, the DNA is  
11 now on the swab, extraction is a process of taking it off that  
12 into a liquid. That liquid is then quantified to see how much  
13 DNA is in there. And from that quant, an aliquat or a small  
14 portion is taken to this amplification process, which again is  
15 in a machine and the machine is called a thermocycler and it is  
16 the one that does these 29 cycles of amplification. The  
17 amplified product is then usually taken and placed on a robot,  
18 which will take an injection from that liquid and inject it  
19 into this capillary I've been speaking of which will then  
20 separate the fragments by size. As they come off, as each one  
21 comes off, it will make a peak in here, and you're looking at  
22 the blue line so you can see those pictures of blues so that's  
23 fluorescing blue. If we go down in the electropherogram, I'll  
24 hit the green line. So this is coming off at the same time but  
25 these are fluorescing green because they have incorporated a

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1 green tag, and I believe Michigan State Police are using 5C  
2 which means five colors. So there are five colors or five  
3 lanes that will be in this e-gram.

4 THE COURT: And to go back just a little bit.  
5 Quantification, that tells you how much DNA is present in what  
6 measurement?

7 THE WITNESS: It tells you how much DNA is present in  
8 your extract as a concentration, how much DNA per unit volume.  
9 And is disappointingly inaccurate. It is an approximate  
10 quantification and at the best it only gets human DNA and  
11 doesn't account for other such things as degradation.

12 THE COURT: And what, what is the measurement of the  
13 DNA?

14 THE WITNESS: It's usually in nanograms.

15 THE COURT: Nanograms. Okay.

16 THE WITNESS: But it could be in picograms which is a  
17 thousandth of a nanogram.

18 THE COURT: And is there a minimum quantity of  
19 measurable DNA that can go through this amplification process  
20 and on to the further analysis that you've described?

21 THE WITNESS: No. There is no minimum. If you have  
22 no DNA or very little DNA, you simply get no peaks. Nothing  
23 bad happens. You just simply get no peaks at the other end.

24 THE COURT: Okay.

25 THE WITNESS: Most people amp negative quants -- which



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1 is amplify, short for amplify, A-M-P -- negative quants, and  
2 quant is short for quantification.

3 THE COURT: Thank you.

4 MR. PRESANT: Ms. Miller, if we can zoom in here where  
5 we were before again. So, Dr. Buckleton, you've explained what  
6 these different numbers mean in terms of the STRs and the peak  
7 heights. When STRmix is reading this electropherogram what is  
8 it doing with that information?

9 THE WITNESS: These are the inputs for the start of  
10 the Markov Chain Monte Carlo process.

11 BY MR. PRESANT:

12 Q Now, before I interrupted earlier you were going to testify  
13 about the decisions that the specific forensic scientist using  
14 the software has to make in addition to inputting the  
15 electropherogram information. Would you please tell the Court  
16 what those decision points are?

17 A The decision points currently in the process for this  
18 version are certain peak analysis decisions which I'll outline  
19 in a minute, and the number of contributors. The peak analysis  
20 decisions are to remove spikes, pull up and forward stutter,  
21 and we are on Fusion so they also have to remove one exotic  
22 stutter.

23 These are standard decisions that are being made in  
24 forensic DNA typing since its inception in the mid-'90s. And  
25 there is nothing novel in that at all.

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1           The other decision point is the number of contributors  
2           that is an input into STRmix. Generally speaking, changing the  
3           number of contributors does not materially affect the result,  
4           and if it does, it affects it in the conservative direction.  
5           So I have been using the phrase you're either correct or  
6           conservative with respect to the number of contributors.

7           THE COURT: Could we go back just a second? There  
8           are, in this case there are going to be, if I understand your  
9           testimony correctly, and the motion of the defense, there are  
10          two discreet areas of inquiry in terms of the usefulness of  
11          this information. The first area of inquiry is in getting  
12          these peaks, this electropherogram. Okay. What are the  
13          variables that can affect the validity of the electropherogram?  
14          Is deterioration of the sample, for instance, is that an issue?  
15          Is there the potential for human error? Is there potential for  
16          mechanical error? Focus if you would for me on that part of  
17          the process.

18          THE WITNESS: Thank you, Ma'am. There is definitely  
19          a, there is always an element of risk from human error. We are  
20          all human. Sample swapping is the one that's been of greatest  
21          concern over the years. I can't speak to that particular  
22          aspect for Michigan State Police and hope someone else can  
23          speak to that, but in my experience enormous care is taken in  
24          laboratories to minimize any risk from human error.

25          You mention degradation of the profile. DNA is an

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1 actually very fragile molecule, and degrades and bacteria, UV  
2 light, and thermal shock are all things that can damage the  
3 DNA.

4 This is no longer a problem. The evolution of  
5 probabilistic genotyping tells us that if a sample is degraded  
6 the software will reliably report that that is uninformative,  
7 there is no information left at that particular locus. So that  
8 is no longer a risk factor, although certainly once upon a time  
9 it was.

10 I don't know what else.

11 THE COURT: With regard to the equipment, you  
12 mentioned robotic, the process becomes robotic at a certain  
13 point. What equipment is used and can failures, what are the  
14 typical failures in the equipment, if any?

15 THE WITNESS: I understand Michigan State Police are  
16 on a 3500 machine. This is the most modern of the capillary  
17 machines. It's a fine tool. No endorsement implied. I think  
18 other witnesses can probably speak to the risk, but this is a  
19 very fine piece of equipment.

20 THE COURT: And it would require a certain amount of  
21 maintenance and so forth, I assume.

22 THE WITNESS: Yes. Yes, they do. And the robots  
23 throw little fits every now and then and throw the samples  
24 everywhere.

25 THE COURT: Okay. And so that, that is the first

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1       discreet part of this process. The second discreet part of the  
2       process is when STRmix comes in to the picture.

3               THE WITNESS: Yes.

4               THE COURT: And tell me what happens then. You get  
5       this electropherogram. What happens then?

6               THE WITNESS: The software that is drawing these  
7       pictures can also output this as a file, and that file is  
8       output and taken as the input for STRmix.

9               THE COURT: And what does STRmix do with that input?

10              THE WITNESS: STRmix takes that input and some  
11       settings that have been set during the laboratory validation,  
12       and one human input, which is the number of contributors, and  
13       then begins the deconvolution process to try and see what  
14       various combinations in the situation we are looking at of  
15       three people, which combinations of three people could explain  
16       this profile. There will be many different combinations of  
17       three people that could explain this profile, and it will  
18       attempt to find all of those.

19              THE COURT: Okay. Mr. Presant.

20              MR. PRESANT: Thank you, Your Honor. So there are the  
21       different inputs, and you mentioned just before we were  
22       discussing those inputs that there are several layers of  
23       conservatism built into the software.

24              THE WITNESS: Yes.

25       BY MR. PRESANT:

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1 Q Would you tell the Court what those layers are and what you  
2 mean by conservative?

3 A In reverse order, conservative is a term used in forensic  
4 judicial work to mean conceding in the interest of the  
5 defendant. So conservatism is generally viewed as a good thing  
6 inasmuch as it concedes rational doubt in the interest of the  
7 defendant.

8 The three layers in this version of STRmix are an  
9 inherent conservatism of the population genetic model. The  
10 model itself is conservative on about the ratio of 99 to 1. So  
11 about 99 percent of the time it understates the value.

12 Q So let's just go into a little bit more detail there. When  
13 you're talking about the population genetic model, there are  
14 empirically studied known frequencies of these specific alleles  
15 in different populations, correct?

16 A Yes.

17 Q And the software incorporates data of those known  
18 frequencies in order to do its mathematical calculations?

19 A Yes.

20 Q All right. And what did you mean by the 99 to 1 with  
21 respect to that data?

22 A We have to predict the occurrence of a genotype at more  
23 than 20 loci. It's almost certain this genotype is either very  
24 rare or doesn't exist at all, and there is no way we can  
25 measure it directly. It is -- the estimate is generated by a

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1 population genetic model. That model assumes a certain level  
2 of population subdivision, that is, that the human population  
3 is not completely homogenous and mixed; that we are genetically  
4 subdivided; and it makes a concession in the interest of the  
5 defendant; and in empirical measurements its concession is such  
6 that about 99 percent of the time it understates the true  
7 value. That is the first level of three.

8 Q Just to be clear, when you're talking about subdivisions,  
9 those are racial subdivisions based on empirical studies and  
10 frequencies?

11 A They are usually sub racial. So I believe Michigan State  
12 Police are using the NIST data so we could talk about the  
13 African American population, the Caucasian population and, for  
14 instance, the Hispanic population. If we talked about the  
15 Caucasian population, even that is not homogenous inasmuch as  
16 there are people of stronger Spanish origin or Italian origin  
17 or anything else. It is that level of subdivision about which  
18 we are speaking.

19 Q So that's the first manner in which STRmix is conservative,  
20 right?

21 A Yes.

22 Q You said there were other ways it's conservative as well.

23 A That's right. There are two further ways in use in this  
24 version. The --

25 Q I'm sorry to interrupt you one more time. But when you say

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1 this version, for all your testimony thus far and going  
2 forward, we are assuming it's 2.3.07.

3 A Yes.

4 Q Unless otherwise stated.

5 A Should I just stop mentioning that?

6 Q No. I think you can just say this version. I just want to  
7 make sure the record is clear you're talking about 2.3.07, the  
8 one used in this case.

9 A Yes, I am.

10 Q I'm sorry, continue.

11 A I notice that MSP are using a coancestry coefficient of one  
12 percent for the African American group. That means the chance  
13 that any two genes are identical by it because of relatedness  
14 is taken as one percent. That is a conservative value. The  
15 global average is about .8 of a percent. And one percent is  
16 higher than .8.

17 Then the third level is that they have applied a  
18 99 percent probability interval. A probability interval is not  
19 strictly the same as a confidence interval but no harm will  
20 happen if we think of that in that way. So we could think of  
21 it as the lower bound out of a 99 percent confidence level.

22 To summarize, there are two layers of conservatism  
23 that can be quantified as being at 99 to 1 in favor of the  
24 defendant, and one further layer that is qualitative and that  
25 is they have used a conservative coancestry coefficient.

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1 Q So what you mean by that conservatism as it relates to this  
2 case, if I told you that the Michigan State Police came up with  
3 a likelihood ratio of 49 million to 1 in this particular case,  
4 is it accurate to say that you think the true likelihood ratio  
5 is actually probably higher than that, but the software has  
6 made those conservative decisions to make the number at the  
7 small end of the range?

8 A That's correct.

9 Q I want to shift to a different topic, Dr. Buckleton, which  
10 is validation. In the development of the software, what sorts  
11 of --

12 THE COURT: Before we go there, Mr. Presant, I want  
13 to, I would like to clarify just a little bit.

14 MR. PRESANT: Of course, Your Honor.

15 THE COURT: What exactly does that ratio represent, 1  
16 out of 49 million?

17 THE WITNESS: The likelihood ratio is a very hard  
18 number to get your head around, Ma'am. And that's the  
19 communication issue that has been a problem.

20 However, again nothing bad will happen if you think  
21 the chance of someone else having this profile is 1 in 49  
22 million. That will give the same value to the evidence.

23 If you want it strictly, this profile is 49 million  
24 times more likely if the named person is a donor than if he is  
25 not.



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1 THE COURT: Okay.

2 MR. PRESANT: So the numerator, the top number, 49  
3 million, is sometimes called the prosecution hypothesis, right?

4 THE WITNESS: Yes.

5 BY MR. PRESANT:

6 Q That you would expect to see this particular profile that  
7 was found on the piece of evidence in this case if the  
8 defendant was a contributor, right?

9 A Yes.

10 Q And the denominator, the bottom number, the 1 is sometimes  
11 called the defense hypothesis, right?

12 A Yes.

13 Q And that's you would expect to see this profile if the  
14 defendant were not a contributor, right?

15 A That's correct.

16 Q Three randomly selected people.

17 A That's correct.

18 Q And so the likelihood ratio is just the ratio of those two  
19 hypotheses, how much more likely is the prosecution hypothesis  
20 as opposed to the defense hypothesis.

21 A Pedantically correcting the language. How much more likely  
22 the evidence is if the prosecution hypothesis is correct.

23 Q I very much appreciate the clarification. It's very easy  
24 to get --

25 A It is very easy.

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1 Q -- confused linguistically.

2 A This is an area that is sometimes referred to as the  
3 prosecutor's fallacy and the most minor misstatements of the  
4 probability phrasing can lead to what's called the prosecutor's  
5 fallacy.

6 Q And that's why forensic scientists are trained very  
7 carefully in terms of how they testify?

8 A Yes.

9 Q All right. Well, I want to come back to likelihood ratios  
10 a little bit later on, but first would you describe for the  
11 Court the validation processes that STRmix went through during  
12 development and as it's been implemented in various  
13 laboratories.

14 A Validation happens in two stages: Developmental validation  
15 and internal validation.

16 Developmental validation we run a number of tests.  
17 The primary one of which I wish to speak at the moment is we  
18 repeat the calculations by a separate method, usually by hand.  
19 So we repeat a great many of the calculations by hand and check  
20 that we get the same answer as the software.

21 Other requirements are to run a number of samples of  
22 true donors and false donors and make sure the performance of  
23 the software is correct.

24 There are quite a number of tests performed, and I'll  
25 be most happy to go to them, but I'll try and summarize them.

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1 We essentially follow the SWGDAM guidelines to the letter, and  
2 we have published our developmental validation process in the  
3 peer reviewed literature.

4 BY MR. PRESANT:

5 Q Let's look at a few of those publications. Can we bring up  
6 Exhibit 4, please? What is Exhibit 4, Dr. Buckleton?

7 A Exhibit 4 is the largest ever validation work. It's a  
8 compilation of the internal validations of 31 laboratories  
9 across the United States and internationally. It was in  
10 response to a PCAST request for a much larger number of samples  
11 to be processed and published.

12 THE COURT: This is a validation of the STRmix  
13 software?

14 THE WITNESS: Yes.

15 MR. PRESANT: And some of the people you've testified  
16 about here today are authors on the paper; there is you at the  
17 end and Dr. Taylor, Dr. Bright.

18 THE WITNESS: So those are the three developers, and  
19 then you can see representatives of a large number of labs  
20 across the United States and internationally.

21 BY MR. PRESANT:

22 Q And this was an example of a peer reviewed published  
23 compilation of internal validations, right?

24 A That's correct.

25 Q I'm sorry if I missed it but would you just distinguish

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1 between internal validation and developmental validation?

2 A Developmental validation is done before we release the  
3 software and it's often called a debugging process and we  
4 iteratively try to repeat calculations and get the same answer  
5 until eventually we get a locked down version of the software  
6 in which we have repeated the number of calculations we see for  
7 yourselves. And then we begin the SWGDAM process, what we  
8 begin and finish the SWGDAM process.

9 Q Is the SWGDAM process the internal validation?

10 A No. It is that as well. It's very clearly both. And once  
11 we release a version or someone such as Michigan State Police  
12 uptake a version, they will then perform the internal  
13 validation. They won't tend to do the by hand calculations;  
14 they take a little bit of training to be able to do. But they  
15 will certainly do a great many samples and other tests of the  
16 software to see that it's fit for purpose.

17 THE COURT: And the STRmix software remains  
18 proprietary, correct?

19 THE WITNESS: I don't know what proprietary means.

20 THE COURT: Not available freely.

21 THE WITNESS: No. It's sold. However, we do respect  
22 the defendant's Fifth Amendment rights and will make the  
23 software and anything else available to the defense.

24 BY MR. PRESANT:

25 Q All right. And how about Exhibit 5, please?

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1 A Exhibit 5 is a publication of the internal validation of  
2 STRmix done at the Federal Bureau of Investigation laboratory  
3 in Quantico, Virginia.

4 Q What about Exhibit 23?

5 A This is not specifically relating to STRmix. This is the  
6 DNA Commission of the International Society for Forensic  
7 Geneticists recommendations for validation. I'm one of the  
8 authors, and STRmix meets the requirements of this document.

9 Q Have you published more peer review journal articles on  
10 STRmix besides the three we just reviewed?

11 A I wouldn't count this one as being on STRmix. There are 33  
12 publications in the peer reviewed literature that I count as  
13 pertaining to STRmix.

14 Q Can we bring up Exhibit 12, please? And go to the second  
15 page 2. Is this the list that you just testified to?

16 A Yes.

17 MR. PRESANT: Your Honor, the government moves for the  
18 admission of 4, 5, 12 and 23.

19 THE COURT: Ms. Kloet.

20 MS. KLOET: I have no objection, Your Honor.

21 THE COURT: They are admitted.

22 BY MR. PRESANT:

23 Q So I want to ask you some specific questions,  
24 Dr. Buckleton, about the operation of the software. You've  
25 already described the hot and cold process by which it reaches

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1 its final number, right?

2 A Yes.

3 Q If you go through that hot and cold process again, the  
4 Monte Carlo engine process, with everything else the same, all  
5 the same inputs, the same electropherogram, the same number of  
6 contributors identified by the analysts, the same population  
7 genetics data, will you get the same answer the second time you  
8 got the first time?

9 A No.

10 Q Why not?

11 A The Monte Carlo effect. So Monte Carlo is a gambling  
12 venue, and the process is like that. It is using random  
13 numbers and the randomness of the process creates a slightly  
14 different answer each time. That answer is usually quite well  
15 clustered and almost always within one order of magnitude.

16 Q What does that mean, one order of magnitude?

17 A A factor of ten. So ten times higher or ten times lower.

18 Q So if you ran this process again and again, I'm  
19 representing to you that Michigan State Police's result in this  
20 case was 49 million to 1, the worst you would expect the  
21 software to do in terms of the lowest number it could come up  
22 with the second time would be approximately 5 million to one?

23 A Yes.

24 Q As a result of that, do you think it's fair to say that  
25 while you can have a low degree of confidence in the precise

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1 answer of the likelihood ratio, you can have a high degree of  
2 confidence in the approximate likelihood ratio?

3 A Yes.

4 Q Does STRmix have a way of measuring the precision with  
5 which the likelihood ratio was attained in a particular case?

6 A Not in this version.

7 Q Not in 2.3.07?

8 A But in subsequent versions it does.

9 Q What sort of diagnostics or analysis are available for  
10 2.3.07?

11 A STRmix outputs a range of diagnostics; the one you might be  
12 referring to the Gelman-Rubin diagnostics. But there are  
13 several others.

14 Q And what's the Gelman-Rubin?

15 A The Gelman-Rubin informs us whether the various chains of  
16 the Markov Chain have converged. So we tend to run either four  
17 or eight chains. And we check whether they have obtained the  
18 same sample space.

19 Q Is convergence of the various chains a good sign or a bad  
20 sign?

21 A It's a good sign.

22 Q Let's talk about the number of contributors. Is there a  
23 limitation on the number of contributors that the software can  
24 handle?

25 A There is no mathematical limitation. There are hardware

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1 limitations. And we become unable to run due to memory  
2 constraints at about five. Most laboratories in the United  
3 States have stopped themselves at either four or five.

4 Q In a mixture as displayed on an electropherogram, can you  
5 determine at least approximately which contributor contributed  
6 more than the others?

7 A Yes.

8 Q And the one who contributed the most is sometimes called  
9 the major contributor?

10 A Yes.

11 Q And the least is the minor contributor?

12 A In America, yes.

13 Q In America. It might have other names elsewhere. Does  
14 STRmix take into account the difference in the peak heights in  
15 doing its mathematical analysis?

16 A Yes.

17 Q Is there a limitation or a lower bound in the software  
18 itself on what, how low the minor contributor can be, what  
19 percentage of the total DNA mixture the minor contributor can  
20 be in order for the software to still do what you would expect  
21 it to do?

22 A No. There is no lower limit. As the minor contributor  
23 becomes smaller, the answer will tend towards inconclusive, and  
24 that is correct, you end up having no information about that  
25 person because he or she is so small, and STRmix will reliably



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1 report the answer inconclusive.

2 Q So the likelihood ratio itself then reflects in a way the  
3 uncertainty created by the smaller proportion of DNA; as the  
4 DNA gets lesser and lesser in the mixture of the minor  
5 contributor, the likelihood ratio is also going to tend lower  
6 as well, is that what you just testified to as well?

7 A That's correct. That's very nicely put.

8 Q Thank you. So you've testified a little bit about this  
9 already but I want to talk about the process for implementing  
10 STRmix in a new laboratory. How many laboratories in the world  
11 have purchased a license to STRmix?

12 A Purchased. I don't know in the world, but in North America  
13 65 percent of laboratories have purchased STRmix.

14 Q 65 percent of all forensic laboratories.

15 A Yes.

16 Q How many of those are actually using it?

17 A There are 31 laboratories, all laboratories systems live  
18 with STRmix in the United States.

19 Q Can we bring up 13, please, Ms. Miller? Do you recognize  
20 13, Dr. Buckleton?

21 A Yes.

22 Q What is it?

23 A It is a download from my web page showing the laboratories  
24 using STRmix and the date they began case work.

25 Q So the columns are here are the areas of the world USA,

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1 Australasia, and the rest of the world, is that right?

2 A Yes.

3 Q Then the rows are the years and the specific laboratories  
4 with their dates.

5 A Yes.

6 Q Michigan State Police are right here on February 22nd of  
7 2016, is that right?

8 A Yes.

9 Q Can we go to page 2, please? And it looks like the most  
10 recent lab in the U.S. to roll it out was in Houston, Texas  
11 just this year.

12 A Yes.

13 Q So this is work that is still going on, you're still  
14 training additional laboratories and staff to use STRmix?

15 A Yes.

16 Q You said that there's training process for specific  
17 forensic scientists?

18 A Yes.

19 Q You've personally delivered some of those trainings?

20 A Yes.

21 Q What is involved in that week-long training of the forensic  
22 scientists? What topics do you cover about how to use the  
23 software?

24 A So it's not a week, it's four days. I'm sure it feels like  
25 a week. We cover theory and practice of use of STRmix. So we

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1 certainly go through the theoretical aspects of the Markov  
2 Chain, and the calculations, and students are expected to do  
3 one calculation by hand, and certainly operation of the  
4 software, use of the diagnostics, and we also speak quite a bit  
5 about how to phrase the LR and report it to court.

6 Q Do you train them on the inputs that they will have to make  
7 based on their interpretation of the electropherogram?

8 A Yes.

9 Q Are you involved in the internal validation in new  
10 laboratories as they come online?

11 A No, not typically. We actually have 12 people working for  
12 STRmix now, and many U.S. labs outsource their work to the  
13 people back in New Zealand, but I'm usually only involved if  
14 some issue arises.

15 Q Have you been involved in the trainings of the Michigan  
16 State Police?

17 A Yes.

18 Q How many have you done with MSP?

19 A Two.

20 MR. PRESANT: Your Honor, the government moves 13. I  
21 should have done it earlier.

22 THE COURT: Ms. Kloet.

23 MS. KLOET: Your Honor, I would like to know who  
24 created that document.

25 MR. PRESANT: I believe the witness testified that it

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1 was a download from his website.

2 THE COURT: Let her voir dire on that exhibit, please.

3 MS. KLOET: I may have missed that, Dr. Buckleton.

4 But did you create the exhibit that's displayed on your screen?

5 THE WITNESS: Yes.

6 MS. KLOET: And when did you create that?

7 THE WITNESS: It's a live document. I update it  
8 regularly. I don't know when I first created it.

9 MS. KLOET: When did you last update it?

10 THE WITNESS: April this year.

11 MS. KLOET: How do you collect information for  
12 inclusion on this document?

13 THE WITNESS: Some of the laboratories write to me  
14 telling me they have gone live, others I find out  
15 retrospectively they have gone live and have to ask them.

16 MS. KLOET: Do you find out firsthand or do you hear  
17 through the community that they have gone live?

18 THE WITNESS: I always check firsthand.

19 MS. KLOET: Thank you.

20 THE COURT: Any objection to the exhibit?

21 MS. KLOET: No, Your Honor.

22 THE COURT: It's admitted.

23 BY MR. PRESANT:

24 Q On the topic of market share, Dr. Buckleton, so you said  
25 65 percent of North American labs approximately have purchased

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1 licenses.

2 THE COURT: How much do the licenses cost,  
3 Dr. Buckleton, do you know?

4 THE WITNESS: No. I don't. I try to ignore the  
5 commercial aspects. But I think it's about 27,000 US dollars  
6 for your first license.

7 THE COURT: And is that for unlimited use of the  
8 software?

9 THE WITNESS: Yes.

10 MR. PRESANT: You have 30 or so labs actively using  
11 the software in North America. What about competitors? Do you  
12 know how many competitors products are used by forensic  
13 laboratories in North America?

14 THE WITNESS: I estimate or from information I have  
15 had is approximately seven are using TrueAllele, and two are  
16 using Lab Retriever. That's spelled just like the dog.

17 MR. PRESANT: Are you familiar with a recent paper  
18 written by Steven Lund and Hari Iyer?

19 THE WITNESS: Yes.

20 BY MR. PRESANT:

21 Q Can we bring up 15, please? Do you recognize Exhibit 15 as  
22 the paper we are talking about, "Likelihood Ratio As Weight of  
23 Forensic Evidence: A Closer Look"?

24 A Yes.

25 Q Have you read the paper?

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1 A Yes.

2 Q What are the general arguments made by Drs. Lund and Iyer  
3 in the paper?

4 MS. KLOET: Your Honor, we have Dr. Lund here. I  
5 would object that he's the best person to explain his arguments  
6 as expressed in that paper.

7 MR. PRESANT: Your Honor, the witness has recently  
8 published, actually just yesterday became available, a response  
9 in a peer review journal of this paper. I suppose there are  
10 two ways to do it. We could recall him on rebuttal after  
11 Dr. Lund has testified, or we could let him testify now as to  
12 what his understanding of what the paper is and then talk about  
13 his published response to it.

14 THE COURT: Let's get it over with now. But, you know  
15 I think you need to keep this within some fairly narrow  
16 discussion. We are going to hear apparently from Dr. Lund. He  
17 does -- I haven't read the whole article but I've also read  
18 the, that little monograph that talks about it. So let's not  
19 go too far afield with the examination of the paper.

20 MR. PRESANT: Thank you, Your Honor. Would you  
21 describe, Dr. Buckleton, concisely if you can the main  
22 arguments made in this particular paper?

23 THE WITNESS: In my view, Drs. Lund and Iyer make two  
24 points: First of all, we should not impose our view of the  
25 evidence on a court, and that is certainly a point I completely

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1 accept. And second, we should take care to understand the  
2 uncertainties in our process, and that's again a point I  
3 accept.

4 BY MR. PRESANT:

5 Q And you've written a couple things in response to it,  
6 correct?

7 A Yes.

8 Q Can we look at Exhibit 18, please? And what's Exhibit 18?

9 A This is a statement I made for the specific case.

10 Q And it treats both the Lund paper as well as arguments  
11 raised by Mr. Adams that we will get to in a second?

12 A Yes.

13 Q And can we bring up Exhibit 28, please? What's 28?

14 A This is the accepted publication of the response to Drs.  
15 Lund and Iyer.

16 Q And you published this paper along with others just  
17 recently, right?

18 A Yes.

19 MR. PRESANT: Your Honor, the government moves 18 and  
20 28.

21 THE WITNESS: Ms. Kloet.

22 MS. KLOET: No objection, Your Honor.

23 THE COURT: They are admitted.

24 MR. PRESANT: Would you describe or summarize, rather,  
25 Dr. Buckleton, the responses that you've published in the two

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1 exhibits we just reviewed? Well, I'm sorry, that you published  
2 in Exhibit 28 and you've also written in Exhibit 18 that you  
3 prepared for this case. Specifically, with respect to  
4 Dr. Lund. We will talk about Mr. Adams in a second.

5 THE WITNESS: Dr. Lund and Iyer's argument has in my  
6 view correctly been likened to a straw man argument. A straw  
7 man argument is where you argue against something that people  
8 aren't even doing, and in mine and my coauthors' opinion they  
9 are arguing against a process that quite simply no one  
10 advocates at all. And specifically, no one that I know of  
11 would impose their view of the evidence on a court.

12 I fully understand my duty is to explain both the  
13 estimations I make and the uncertainties in that so that the  
14 factfinders can draw a correct opinion as to the weight of  
15 evidence.

16 BY MR. PRESANT:

17 Q So that's the first argument with respect to the role of  
18 the courts in understanding scientific evidence, right?

19 A Yes.

20 Q And what about the second critique they have about  
21 incorporating uncertainty into models as they are presented in  
22 court?

23 A Well, they make the not too startling suggestion that if  
24 you change the inputs you will change the outputs. This is  
25 barely news. I wish to add that both these doctors are my



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1 personal friends, so I don't wish to be too harsh.

2 Q You worked at NIST with them, correct?

3 A I did. They were several doors up the corridor from me and  
4 we are friends.

5 But, yes, I'm perfectly happy to explain the  
6 uncertainties in the process. In fact, I argue not only would  
7 I explain them here but I've published them.

8 Q And you've also testified here and explained elsewhere in  
9 the literature that STRmix in coming up with its final number  
10 attempts as well as it can to reflect uncertainty and to make  
11 decisions, you've made decisions in developing it in the  
12 conservative direction, so any uncertainty is resolved in favor  
13 of the defendant.

14 A That's correct.

15 Q Now, in reading the Lund/Iyer paper, can I ask you was it  
16 specific to forensic DNA analysis or to STRmix in particular?

17 A It's, it's neither of those. It's a very general paper  
18 speaking completely about modeling for likelihood ratios.

19 Q General to forensic science, right?

20 A Yes. It could apply to firearms or footwear or any other  
21 thing.

22 Q And they advocate for testing the same evidence with a  
23 number of different models and then explaining all of the  
24 decisions that were made to the jury, correct?

25 A Possibly even infinite models.

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1 Q They say it's possible to, right, create an infinite number  
2 of models, right?

3 A Yes.

4 Q But in a finite criminal trial, a criminal trial that has a  
5 limited amount of time, it's not possible to introduce infinite  
6 number of models to the jury, right?

7 A That's true. And one would have to really doubt or I would  
8 doubt my own ability to convey all that information  
9 meaningfully.

10 Q What do you mean by that?

11 A Well, if I sat here and gave an infinite number of possible  
12 answers and possible models, we would be here for a very long  
13 time, and I suspect the clarity of my presentation would fail.

14 Q And the jurors certainly wouldn't be experts in  
15 probabilistic genotyping or in the biological and chemical  
16 processes that go into DNA analysis that were used by the  
17 developers of STRmix or the lab in making specific decisions  
18 that led to the selection of the particular model, correct?

19 A That's correct.

20 Q Let's turn to another topic. Can we bring up Exhibit 17.  
21 Do you recognize Exhibit 17?

22 A Yes.

23 Q What is it?

24 A It's the report of Mr. Nathaniel Adams.

25 Q The report he wrote for this case in particular, right?

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1 A Yes.

2 Q You understand it's subject to a protective order?

3 A Yes.

4 Q Did you review this report?

5 A Yes.

6 Q Did you write a response to it?

7 A Yes.

8 Q And that response is also contained in Exhibit 18?

9 A Yes.

10 Q What's your familiarity with Mr. Adams?

11 A Mr. Adams and I are cordial acquaintances. I would like to  
12 say friends. We have exchanged e-mails a number of times and I  
13 spent four days with him in training in Ventura, California.

14 Q Has he been involved in reviewing STRmix prior to this  
15 case?

16 A Yes.

17 Q Has he reviewed the source code for STRmix prior to this  
18 case?

19 A Yes.

20 Q Did you read the report he wrote in that case?

21 A Yes.

22 Q So would you summarize for the Court then your view of  
23 Mr. Adams's report here in what's been marked Exhibit 17? And  
24 if you would like to refer to your written statement in  
25 Exhibit 18, or any of the other supporting materials just ask

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1 me, we will bring it up.

2 A Thank you. Mr. Adams makes a number of sensible and valid  
3 points many of which we have listened to. They tend to go to  
4 the cosmetic or theoretical appearance of code style and  
5 documentation, and at no point has he actually questioned the  
6 or found fault in the functionality.

7 His argument is that testing or I believe his argument  
8 to be that testing is inadequate for validation, and that we  
9 really should pay a lot more attention to code quality. Again,  
10 I would say he has some veracity to that. But his conclusions  
11 just massively go beyond the data he's used for those.

12 Without diminishing the importance of code quality or  
13 documentation, STRmix is the single most tested and trialed  
14 software in use in this field. It's been tested by multiple  
15 groups in multiple situations. And I would suggest that there  
16 is a very good basis for accepting its reliability.

17 BY MR. PRESANT:

18 Q All right. Mr. Adams makes much of these IEEE standards,  
19 correct, in this report?

20 A Yes.

21 Q And what is your view of the applicability of the IEEE  
22 standards to probabilistic genotyping software like STRmix?

23 A So IEEE is the most commonly used standard setting body in  
24 computer science. It's not without its faults. For instance,  
25 adherence to IEEE has actually caused a bug in Excel. And

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1 Microsoft itself complies with some but not all of IEEE.  
2 However, moving to Prob Gene, none of the guidance bodies have  
3 suggested adherence to IEEE. The ISFG, International Society  
4 of Forensic Geneticists, do make some suggestions for including  
5 core computer science principles, and in many cases I was the  
6 proponent of those. The Forensic Science Regulator also makes  
7 suggestions that it should be developed within a quality  
8 system, and I would suggest that it is developed within that  
9 quality system.

10 So in summary, I would say that Mr. Adams makes some  
11 valid points. But that whilst we are listening to these, they  
12 do not diminish the value of the extensive testing that's been  
13 done on STRmix.

14 BY MR. PRESANT:

15 Q Do his points he makes, which are valid as you've testified  
16 to, give you concern about the functionality of the operation  
17 or rather the functionality of version 2.3.07?

18 A No, they don't. His, some of his points are completely  
19 valid and I recognize them immediately. Some he's just got the  
20 wrong end of the stick or not been given the correct data.

21 Q So let's talk about some of those. One thing that  
22 Mr. Adams says in his report is that he didn't review certain  
23 documents, he didn't review something called Github. What's  
24 your reaction to those points he's making?

25 A Some of those things we could have made available to him.

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1 They do exist. And some we did make available and he didn't  
2 recognize them as the document he was seeking, and some he is  
3 asking for do not exist.

4 Q Can we go to page 6 of Exhibit 18?

5 A Yes.

6 Q We will bring it up on the screen. But it's in front of  
7 you as well. This is the appendix to the statement you wrote  
8 for this case, is that right?

9 A Yes.

10 Q And what are you trying to do in this appendix?

11 A This is a point by point response to Mr. Adams's  
12 commentary.

13 Q So let's go through them, if you can summarize each of them  
14 one by one so that the Court has the opportunity to ask you any  
15 clarifying questions it might have about them. You can start  
16 with 4.1.3.

17 A Okay. Well, Mr. Adams I believe is just simply incorrect  
18 in his assertion that this will affect the deconvolution. If  
19 we come to test script, I just need to check. So the test  
20 script is clearly not in the format he would have liked but we  
21 believe contains the information that he sought. And I think  
22 there was some confusion over what expected result is. So the  
23 expected result is a defined thing. For instance, reproducible  
24 means we've been able to get the same number by a different,  
25 separate and independent mechanism.

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1           Issue trackers relate to the use of Github, I think,  
2           and we do indeed use Github. And we don't know as yet whether  
3           we could technically give him access to just the single branch  
4           for 2.3.07. It seems likely he actually wants the entire back  
5           history of STRmix which we'll have to see if we can technically  
6           achieve.

7           MR. PRESANT: Ms. Miller, we are on the bottom of page  
8           7.

9           THE WITNESS: The change log does identify the  
10          changes, and we think the deficiency here is that Mr. Adams  
11          would have actually liked the change logs all the way back to  
12          inception. Which we may be able to give him some but not all  
13          of those because this process began at some point.

14          Dates of changes, Mr. Adams has assumed that's the end  
15          date. It's actually the beginning date of this document, and I  
16          have put down the timeline for that segment.

17          The run-time checks, Mr. Adams is mathematically  
18          incorrect, and it's disappointing to see him speaking on the  
19          subject.

20          BY MR. PRESANT:

21          Q     Well, will you explain why he's mathematically incorrect,  
22          or how do you know that?

23          A     A Markov change should be a memory less walk and a Gaussian  
24          walk that proposes an illegal value should still be counted.

25          Focus on reproducibility. Reproducibility means we

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1 have been able to reproduce the result.

2 Q Before we get too far ahead from the random walk, can we go  
3 briefly to Exhibit 27? What's 27, Dr. Buckleton?

4 A It's a chapter from a basic text on Monte Carlo Markov  
5 Chain.

6 Q And can we go to I believe it's page 19 of the PDF? It's  
7 page 185 of the textbook chapter. Zoom in on this gray box.  
8 What's the significance of the part we have just blown up there  
9 in the gray box?

10 A That is a part that explains that you should count Gaussian  
11 walk proposals that are outside the constrained limits.

12 MR. PRESANT: G-A-U-S-S-I-A-N, did I spell that  
13 correctly?

14 A You did.

15 Q And is this what Mr. Adams misapprehended in the criticism  
16 in 4.2.2.2?

17 A Yes.

18 Q Let's go back to -- well before we go back.

19 MR. PRESANT: The government moves to admit 27, Your  
20 Honor.

21 THE COURT: Ms. Kloet.

22 MS. KLOET: If I could ask a couple questions as to  
23 its genesis.

24 THE COURT: Sure.

25 MS. KLOET: Dr. Buckleton, was this document provided



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1 to you by the government or did you provide it to the  
2 government?

3 THE WITNESS: I provided it to the government.

4 MS. KLOET: Okay. Is this an excerpt from a textbook  
5 that you reviewed in a course that you were enrolled in?

6 THE WITNESS: No.

7 MS. KLOET: Where did you find this textbook?

8 THE WITNESS: This was sent to me by Dr. Duncan Taylor  
9 when I asked him for formal proof of this particular rule.

10 MS. KLOET: And Duncan Taylor is the co-creator of the  
11 STRmix program, correct?

12 THE WITNESS: Yes.

13 MS. KLOET: He's a geneticist?

14 THE WITNESS: I'm not sure. His degree, his doctorate  
15 degree was studying STRs in Australian snakes.

16 MS. KLOET: Would it be fair to say he's a forensic  
17 scientist?

18 THE WITNESS: Yes.

19 MS. KLOET: Thank you. I don't have any objection.

20 THE COURT: It's admitted.

21 MR. PRESANT: Can we go back to page 8 of Exhibit 18,  
22 please? I interrupted you, Dr. Buckleton, when you were on  
23 4.2.6, Focus on reproducibility.

24 THE WITNESS: So we use the word reproducible to mean  
25 we are able to reproduce the result by a separate method which

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1 is usually by hand in Excel.

2 Recreation testing means testing against previous  
3 versions and we do indeed do that, and that's outlined in the  
4 R&T report.

5 Testing and verification. So we actually set the  
6 changes for each version in a thing called a change request,  
7 and I think Mr. Adams would prefer this to be a vastly more  
8 technical document. And that's certainly something we could  
9 do.

10 STRmix defects. Mr. Adams is unaware of the process  
11 for notifying stakeholders. He didn't ask for it, and we would  
12 have been happy to tell him that all stakeholders are notified  
13 of all defects as soon as we diagnose them and measure the  
14 extent of the troubles.

15 Published. So indeed both the STRmix web page and my  
16 own web page outline defects, and we openly disclose them to  
17 the community. I'm not sure what he wants further. He calls  
18 them plain language descriptions, which they are. I'm sure we  
19 could provide him if requested with some more technical data.

20 I'm not sure what he means by Unpublished but known to  
21 ESR. I don't think we have any. We don't do that. That's not  
22 part of our philosophy.

23 The bug known to MSP. Mr. Adams has misunderstood  
24 something.

25 BY MR. PRESANT:

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1 Q What has he misunderstood?

2 A Well, it's not a bug. The creation of a locus with a zero  
3 when all other loci are performing well is a diagnostic usually  
4 indicating an input error.

5 Q What about 4.3.4.3?

6 A So this is entitled Garbage collection. Mr. Adams suggests  
7 that it is improperly coded. It's actually a completely  
8 unnecessary function and has been removed. But it had no  
9 effect on 2.3.07.

10 Code style. He wishes to know the author of the code.  
11 Well, the author of nearly all the code or possibly even all  
12 the code is Dr. Duncan Taylor. But the three words, Admin,  
13 Owner and Dude, refer to computers on which Dr. Taylor was  
14 working.

15 Object oriented principles is the next one. And Dr.  
16 Adams argues that our use of them is limited and I think he  
17 says something slightly rude. Where is it? Anyhow, he was  
18 critical of our use of it and possibly with some justification.  
19 We have certainly upped the use of this, but this goes to style  
20 rather than functionality.

21 Q Is that a way to view most or if not all of his criticisms  
22 of STRmix is that they are stylistic preferences that don't  
23 actually affect the way the software is operating?

24 A That is what I am going to say. I believe his comments are  
25 stylistic and do not affect the operation. Mr. Adams's actual

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1 argument would be they are stylistic and although he can't  
2 detect that they could affect the operation.

3 Q Are you aware of any probabilistic genotyping software that  
4 meets Mr. Adams's stylistic preferences?

5 A I don't believe any of them would get close. But we would  
6 get the closest.

7 Q Now, one of his criticisms was the identification and  
8 disclosure of miscodes, right?

9 A Yes. Is it a criticism. Yes, carry on, please.

10 Q Can we bring up Exhibit 14, please? What is 14,  
11 Dr. Buckleton?

12 A 14 is a download from my web page of the miscodes detected  
13 to date in STRmix.

14 MR. PRESANT: Government moves to admit 14, Your  
15 Honor.

16 THE COURT: Ms. Kloet.

17 MS. KLOET: I just have a couple brief questions.  
18 Dr. Buckleton, when was this document created?

19 THE WITNESS: This document is a live document and  
20 I've been updating it regularly. Updated it most recently I  
21 think on the weekend just gone.

22 MS. KLOET: This past weekend.

23 THE WITNESS: Yes, I believe so.

24 MS. KLOET: When was it first created?

25 THE WITNESS: I don't know.

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1 MS. KLOET: When was it first uploaded to the website?

2 THE WITNESS: I don't have that information, I'm  
3 sorry.

4 MS. KLOET: Do you have an approximate idea?

5 THE WITNESS: Well, this is my web page. The  
6 individual things are released individually. This was a  
7 compilation that I think I made about six months ago.

8 MS. KLOET: Are you the only individual who has added  
9 information to this document?

10 THE WITNESS: The information is compiled by me from  
11 information given to me by others.

12 MS. KLOET: Okay.

13 THE WITNESS: So you could argue that others have had  
14 input into it.

15 MS. KLOET: Just so I'm clear, this document has been  
16 on the website available to the public for how long?

17 THE WITNESS: In various forms for six months.

18 MS. KLOET: Okay. Thank you.

19 THE COURT: Any objection to the Exhibit?

20 MS. KLOET: No, Your Honor.

21 THE COURT: It's admitted.

22 BY MR. PRESANT:

23 Q Dr. Buckleton, on Exhibit 14, the two, I'm sorry, there are  
24 more than two pages. On the multiple pages of Exhibit 14, I  
25 think you identify seven miscodes, is that right?

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1 A Yes.

2 Q How many of those miscodes impacted the version at issue in  
3 this case, 2.3.07?

4 A One.

5 Q Which one is that?

6 A Number 3.

7 Q Can we just zoom in on number 3? Would you explain to the  
8 Court how this miscode was identified and what significance if  
9 any it had on the calculation of the likelihood ratio in  
10 version 2.3.07?

11 A This miscode was detected by testing, and it has an error  
12 in the conservative direction, and that error is very minor and  
13 occurs in very rare circumstances.

14 Q So if that error had an impact in this case, where 2.3.07  
15 was used, if anything, it would have made the likelihood ratio  
16 smaller than it should have been?

17 A Yes.

18 Q Now you're on version 2.6 currently, right?

19 A Debugging, yes.

20 Q Have you identified bugs or miscodes in 2.6?

21 A Yes.

22 Q And is 2.6 being worked on by Dr. Taylor or have other  
23 people come in and taken over the coding?

24 A The coding is now done by professional coders, and I think  
25 would meet many of Mr. Adams's requirements now.

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1 Q But you still found bugs, right?

2 A 416 to date.

3 Q Can we bring up again Exhibit 18, page 4 this time? This  
4 table at the top. So you found 416 bugs to date in 2.6 which  
5 is being worked on by professional coders you said, right?

6 A Yes.

7 Q What does that tell you about the significance of bugs in  
8 code to the operation of the code?

9 A Professional coders are not, there will be bugs and they  
10 have to be found by testing.

11 Q Like the testing that's done in validation?

12 A Yes.

13 Q Now, Mr. Adams also makes much of the need for code to be  
14 open source. Are you familiar with that criticism?

15 A Yes.

16 Q What's your view of it?

17 A When I first heard of open source, I thought it was a  
18 fantastic idea, and my liberal civil service background makes  
19 me think that's a really good concept, which is you make the  
20 code available publicly. Over time I have decided it's a  
21 terrible idea. And I'm going to give multiple answers but this  
22 also appears on my web page.

23 First of all, it actually means anyone can download  
24 and use the code without training. And this truly horrifies  
25 me. You cannot buy STRmix without training, and in fact many

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1 people have asked us that we take more care for the labs who  
2 are using STRmix rather than less. So just throwing it out  
3 into the public domain and saying have a go is really akin to  
4 tossing the keys to your new Ferrari to your teenage son. And  
5 I just think it's just a disaster waiting to happen.

6 The other things I've noticed is that the open source  
7 are very light in documentation. Mr. Adams comments about our  
8 lack of documentation. Well ours would be orders of magnitude  
9 ahead of their's.

10 They also would not meet IEEE coding standards, and  
11 seriously I start to wonder if there is even a safe activity  
12 for forensic science.

13 Q Turning to a different topic. You're familiar with and  
14 you've testified here today about the PCAST report, right?

15 A PCAST report was released in 2016, October 2016.

16 Q And the PCAST report touched on a number of areas of  
17 forensic science, one of which was probabilistic genotyping,  
18 right?

19 A Yes.

20 Q And would you summarize for the Court what PCAST said about  
21 probabilistic genotyping?

22 A The key finding in the PCAST report is finding 3. Is that  
23 going to appear here or shall I go from memory?

24 Q I have not marked it as an exhibit.

25 A Okay. I can do it from memory, I hope. Finding 3 has two



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1 parts. The first part says that the community should move  
2 rapidly to more objective methods such as probabilistic  
3 genotyping. And part B is that probabilistic genotyping has  
4 demonstrated its validity up to three-person mixtures in which  
5 the minor is at least 20 percent.

6 Q What's your view of those findings by PCAST?

7 A First of all, those findings were amended. Do you want me  
8 to go to the amendment or just say my view of it?

9 Q I would appreciate it if you would summarize the amendment  
10 first then go to your view.

11 A So PCAST continued to work on this. Subsequent to their  
12 report coming out, they engaged in conversation with me and  
13 others, but I think predominantly me, by e-mail and phone and  
14 then eventually by meeting. And they outlined to me at that  
15 meeting, which was highly disrupted, they outlined to me what  
16 they would like to be done to meet their standard of proof, and  
17 that is now being done.

18 The amendment in particular came out in January 2017  
19 and amended certain small aspects of that wording I have given  
20 to you.

21 Q And what's your view of the amended version of the PCAST  
22 finding?

23 A At the time of its appearance it was a massive  
24 understatement of the power of the system. And this came about  
25 because of their requirement that proof be published in the

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1 peer reviewed literature. It is very hard to publish internal  
2 validation work in the peer reviewed literature. It is boring  
3 and journals often have a policy against it. However, there  
4 are now two very large internal validation publications on  
5 STRmix which makes in my view STRmix the most tested and most  
6 published in peer reviewed software of this type available.

7 Q We reviewed one of those publications earlier.

8 A Looked at them both. We looked at the FBI internal  
9 validation and the 31 laboratory compilation.

10 Q That's Exhibits 4 and 5.

11 A Yes.

12 Q What about these limitations, the three-person mixture and  
13 the 20 percent for minor contributor, was PCAST right about  
14 those?

15 A PCAST amended the word minor to person of interest. And  
16 that was correct. And that was at my request that they do  
17 that. And the fact that they made that fairly obvious mistake  
18 of wording is problematic. PCAST do suggest they expect the  
19 range to expand as new studies are published, and I would  
20 suggest that those studies have been published and therefore we  
21 have met PCAST requirements.

22 Q In terms of the number of contributors and the sensitivity  
23 down to the minor contributor?

24 A That's right. We have gone up to five-person mixtures.  
25 The study is massive, it's 28, 25 mixtures. And massive

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1 number, 28 million non donor tests. It's a massive study.

2 Q When STRmix is internally validated by a particular  
3 laboratory, are those things they study how the number of  
4 contributors that it can analyze in its system and the  
5 percentage or the limitation on the minor contributor that can  
6 be used?

7 A Yes.

8 THE COURT: What exactly does that mean,  
9 Dr. Buckleton, in your view, that "Probabilistic genotyping has  
10 demonstrated its validity up to three-person mixtures in which  
11 the minor is at least 20 percent." What does that mean?

12 THE WITNESS: So the three-person mixture is probably  
13 obvious. That suggests it hasn't demonstrated it for four or  
14 five-person mixtures, as at their writing. And the minor being  
15 20 percent would mean that at least 20 percent of the DNA must  
16 come from the smallest donor.

17 THE COURT: What is the significance if that number is  
18 less than 20 percent?

19 THE WITNESS: As at writing, PCAST would say that that  
20 hasn't been validated. They would have been incorrect.  
21 However, they are the President's council and I must show them  
22 due respect. And I have asked them what they would need to  
23 extend that statement, and they outlined to me what they would  
24 need and we have done it.

25 THE COURT: What have you done?

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1 THE WITNESS: We have done a compilation that goes  
2 well below 20 percent, down to effectively zero percent. And  
3 four and five-person mixtures. And we have published that.

4 THE COURT: So if I understand you correctly, using  
5 STRmix you can validly demonstrate the presence of DNA of up to  
6 three people or up to five people where the minor or the person  
7 of interest, as you put it, has contributed what?

8 THE WITNESS: Well, zero, Ma'am. But it wouldn't  
9 demonstrate their presence. If there was zero of the person,  
10 it would answer inconclusive. So STRmix will reliably report  
11 when it knows and when it doesn't know.

12 THE COURT: If it reports one percent, what does that  
13 mean?

14 THE WITNESS: It will give a very low LR and suggest  
15 that it has a high uncertainty about whether that person is  
16 there or not.

17 THE COURT: Okay. Thank you. Mr. Presant, how long  
18 how much longer do you anticipate your direct examination?

19 MR. PRESANT: Maybe just ten minutes.

20 THE COURT: Okay. We will take our, well, I am going  
21 to have one question after you're done and then we will take  
22 our break.

23 MR. PRESANT: Thank you, Your Honor. Dr. Buckleton,  
24 STRmix was excluded by a court in one case, is that right?

25 THE WITNESS: Not STRmix but the evidence, yes.

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1 Sorry. But pedantic.

2 BY MR. PRESANT:

3 Q I think it's an important clarification so I appreciate you  
4 making it. What case was that in which it was excluded,  
5 evidence was excluded?

6 A That was People versus Hillary in New York State.

7 Q Were you involved with that case?

8 A Yes, I was.

9 Q Would you describe for the Court the analysis in that case  
10 and what led the Court to exclude the evidence?

11 A The case involved the fingernail scrapings of a deceased  
12 12-year-old boy. They presented as a very imbalanced  
13 two-person mixture where the minor contributor was very small,  
14 and the work was done by the New York State police. New York  
15 State police did not have STRmix and do not have parameters for  
16 STRmix, so I borrowed parameters for the analysis from a  
17 Toronto lab who used the same kit and chemistry. This was  
18 candidly disclosed to the Court. And His Honor deemed that to  
19 be inadequate. And I do not relitigate that. That is his  
20 decision, not mine. He did say that STRmix was generally  
21 accepted and had been validated, but that I had used it  
22 improperly in that case by the act of borrowing samples,  
23 borrowing parameters.

24 Q Have you tried to approximate the number of cases in which  
25 STRmix has been admitted or rather evidence derived from STRmix

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1 has been admitted?

2 A We have a lot of trouble getting this information. But we  
3 think conservatively it's, it's been admitted without an  
4 admissibility hearing, so just used --

5 Q Used in court.

6 A In the United States, several thousands.

7 Q And it has faced several challenges where there was an  
8 admissibility hearing?

9 A Nine by me, and some by other people.

10 Q And have there been any other cases besides the New York  
11 case that you just described in the United States where  
12 evidence derived from STRmix has been excluded?

13 A No.

14 MR. PRESANT: Nothing further, Your Honor.

15 THE COURT: Thank you. I do have one, and you may  
16 want to think about this over the break if you're not prepared  
17 to answer it at this point. But early in your testimony you  
18 talked about communicating the results of STRmix to a  
19 factfinder or to a Court and the necessity to do that  
20 accurately and properly. And in your discussion of the  
21 training that you provide to a purchaser of your software, that  
22 you emphasize how to phrase the likelihood ratio and report it  
23 to the Court.

24 THE WITNESS: Yes.

25 THE COURT: If this evidence is going to be submitted

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1 to a jury in this case, how would you articulate an instruction  
2 to the jury of how to use it or how to understand it or how to  
3 apply it? Because that's really --

4 THE WITNESS: Yes.

5 THE COURT: -- my task.

6 THE WITNESS: No, I understand. I'm honored by you  
7 asking me my opinion. And you're very correct to highlight  
8 this as an important point.

9 Most of the discussions of statistical evidence in  
10 court relate to understanding the result, and that's not just  
11 likelihood ratio, that's any statistical evidence. And there's  
12 a lot of evidence that it's done poorly.

13 In this particular case, the statistic is substantial,  
14 and if the statistic is deemed reliable and put to court, one  
15 would have to say it's something like very strong evidence to  
16 suggest the presence of the accused in this mixture. We tend  
17 to stop short of certainty, but this is very strong evidence.

18 THE COURT: Well, that's my concern. Because I think  
19 the jury needs to be armed with the ability to understand both  
20 sides of that. By saying to the jury the ratio, the likelihood  
21 ratio is 49 million to 1, without more that's really game over  
22 for most lay people.

23 THE WITNESS: 49 million to 1 is very strong evidence.  
24 It is. I don't know what -- I mean game over may be an  
25 American term. I think I can obviously glimpse what it means.

## DR. JOHN BUCKLETON - DIRECT EXAMINATION - MR. PRESANT

1 I mean we hold open a very small chance that someone else may  
2 produce evidence of this strength. In fact, that chance is  
3 roughly 1 in 49 million. Obviously that's not quite certain.  
4 It has to be zero to be certain. But it's amazingly strong  
5 evidence.

6 THE COURT: Thank you, Dr. Buckleton. Okay. It's  
7 11:30. We are going to take 45 minutes and come back here at  
8 12:15 and start with cross-examination of Dr. Buckleton.

9 THE LAW CLERK: All rise. The court is in recess.

10 (Recess taken, 11:32 a.m.; Resume Proceedings,  
11 12:23 p.m.)

12 THE LAW CLERK: All rise. Court is back in session.  
13 Please be seated.

14 THE COURT: Dr. Buckleton, first of all, obviously  
15 you're still under oath. But I just want to follow up a little  
16 bit on the last discussion that we had before we adjourned.

17 You aren't proposing, are you, that I tell the jury  
18 that the results of probabilistic genotyping are powerful  
19 evidence, are you?

20 THE WITNESS: I believe the evidence in this case is  
21 powerful, is that what you mean?

22 THE COURT: No, that's not what I mean.

23 THE WITNESS: Probabilistic genotyping is just a tool,  
24 and it can only do, it can only do things if the evidence is  
25 there.



## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 THE COURT: Okay. Ms. Kloet, are you ready for your  
2 cross-examination?

3 MS. KLOET: Yes, Your Honor.

4 CROSS-EXAMINATION

5 BY MS. KLOET:

6 Q Dr. Buckleton, you didn't write the software at issue in  
7 this case, did you?

8 A No.

9 Q I'll repeat the question. If could you re answer it.  
10 Dr. Buckleton, you didn't write the software that was at use in  
11 this case, did you?

12 A No.

13 Q I believe it was your testimony that Duncan Taylor did,  
14 correct?

15 A I think either all or most of it.

16 Q You also testified today that Duncan Taylor is a forensic  
17 biologist, correct?

18 A Yes.

19 Q He's not a computer scientist.

20 A No. He's a scientist who programs.

21 Q You don't need a degree to program software, do you?

22 A No.

23 Q Okay. You testified in a Michigan State case a couple  
24 years ago called People versus Mohammed?

25 A Yes.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 Q In fact, that was the first time I believe you ever  
2 testified in a Daubert hearing.

3 A No.

4 Q It wasn't?

5 A No.

6 Q When was the first testimony?

7 A 1995.

8 Q And that was in a United States Daubert hearing?

9 A In South Carolina.

10 Q Did that have to do with probabilistic genotyping?

11 A No.

12 Q Okay. The one in Muhammad is the first time you ever  
13 testified in a Daubert hearing involving probabilistic  
14 genotyping.

15 A Yes.

16 Q Okay. Thank you. And you were asked during that hearing  
17 by defense counsel, "You're not a computer guy, are you?" And  
18 you responded, "No." Is that correct?

19 A Possibly, yes.

20 Q Okay. I understand based on your earlier testimony that  
21 STRmix version 2.6 is now being coded by a professional coding  
22 company, correct?

23 A Yes.

24 Q And it's still in the testing process, fair to say?

25 A Yes.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 Q And during that testing process 416 miscodes have been  
2 identified. Right?

3 A I'm going to say yes.

4 Q I think that was in the chart.

5 A Yeah, it's at least 416. I'm not sure miscodes is the  
6 right word but certainly the tenor of your question is correct.

7 Q Okay. Thank you. So there were 416 miscodes, or for lack  
8 of a better description, similar problems or issues identified  
9 and this was after bringing in professional software  
10 developers, correct?

11 A Yes.

12 Q How many miscodes were identified in 2.3.07 during the  
13 testing process?

14 A I don't have that information.

15 Q How can you assure the Court that there are no other errors  
16 to version 2.3.07 that was used here?

17 A No one can ever make such an assurance.

18 Q You also testified regarding the assistance of peer  
19 reviewed articles that relate to STRmix.

20 A Yes.

21 Q Almost all of those articles are in one journal, isn't that  
22 right?

23 A That's the journal I tend to submit to, yes.

24 Q And that journal would be "Forensic Science International"?

25 A No.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 Q What journal is that?

2 A "Forensic Science International Genetics".

3 Q Thank you, I misspoke. Now that's not a software  
4 engineering journal, is it?

5 A If one were writing for the forensicology community why  
6 would one publish in a software engineering journal?

7 Q From that is your answer no?

8 A I think no.

9 Q It's not a computing journal, is it?

10 A No.

11 Q Okay. You testified today that you're familiar with the  
12 IEEE standards.

13 A I know of them.

14 Q Okay. So you know that one of the recommendations in the  
15 guidance from IEEE is that software should go through  
16 independent validation and verification processes.

17 A Yes.

18 Q You also testified that you are a member I believe of the  
19 ISFG?

20 A Yes.

21 Q Could you remind me again what that acronym stands for?

22 A International Society of Forensic Geneticists, but I  
23 particularly meant I was on the panel of the DNA commission.

24 Q Okay. One of the recommendations of the ISFG in the recent  
25 article that was presented to you by the government was that to

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 incorporate the IEEE standard of independent testing, correct?

2 A We probably meet that standard.

3 Q Do you agree that that is what the article itself stated?

4 A Yes, I think it did, yes.

5 Q Okay. And, in fact, the United Kingdom Forensic Science

6 Regulator that you previously testified about, they too

7 recommend independent testing of software.

8 A Yes. But I think we meet that requirement.

9 Q Okay. The version in 2.3.07 or version 2.3.07, pardon me,  
10 that was used here, that did not follow the independent review  
11 according to the IEEE standards.

12 A Yes, I think it did.

13 Q In what way?

14 A Do you have IEEE and particularly the addendum on the  
15 independent review?

16 Q I can --

17 A The full requirements for independent review.

18 Q I can bring up the article that was previously, that  
19 references the IEEE standard.

20 A I need the actual IEEE I think.

21 Q I don't have it.

22 A I do on my laptop. I'm sure Mr. Adams has it.

23 Q I think -- let's table that for a minute and move forward.  
24 I'm referencing the, I'm talking about the reference that was  
25 made in the article that was previously admitted as an exhibit.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 A Which article would that be?

2 Q I'm sorry?

3 A Which article?

4 Q The ISFG article.

5 A Yes, I think we meet the IEEE validation or verification  
6 they call it requirements.

7 Q Okay.

8 THE COURT: What do you understand independent  
9 verification to mean?

10 THE WITNESS: I understand it differently from IEEE.  
11 So IEEE says such things such as the facilities and resources  
12 should be separate, the personnel should be separate, and the  
13 funding should be separate. And I think we achieve that.

14 I would actually mean they should be separate from the  
15 developers altogether. And to some extent we have met that as  
16 well.

17 BY MS. KLOET:

18 Q Your testimony just now is to some extent. To what extent?

19 A So in particular, the group who do the validation or  
20 verification do not do the programming. They are a separate  
21 group. So in that regard, we maintain independence from the  
22 coders. That independence has softened slightly by the fact  
23 that we find bugs and you get into an iterative process of  
24 talking with the coders. Now speaking of complete separation,  
25 at least two groups have done some quite extensive by hand

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 verification of the STRmix outputs.

2 Q So your statement just now is that they have done  
3 verification of the STRmix outputs. Does that mean they have  
4 duplicated the mathematics in the program?

5 A Yes, yes.

6 Q How many calculations are there in a STRmix analysis?

7 A A typical analysis would be hundreds of millions.

8 Q So is it your testimony today that hundreds -- the  
9 hundreds of millions of mathematical equations that are  
10 required for STRmix to run once have been repeated in toto?

11 A There are not hundreds of millions of equations. There are  
12 hundreds of millions of calculations, and a sample of them  
13 would have been tested.

14 Q So it was a sample that was tested, not all of the  
15 calculations.

16 A You can't even begin to do all of them.

17 Q Okay. Thank you. You testified just a moment ago about  
18 the independence of the review of the software for validation  
19 of the software. How many of those reviews involved a review  
20 of the source code?

21 A None.

22 Q Has anyone reviewed the source code?

23 A Only Mr. Adams.

24 Q Okay.

25 MS. KLOET: If I could confirm what he is viewing. I

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 can confirm that's what I intended to bring up and I could use  
2 my paper copy as a reference. If that pleases the Court.

3 THE COURT: What are we after here?

4 MS. KLOET: Your Honor, I have a copy of the STRmix  
5 comparison reports, the seven-page document that was generated  
6 in this case and I would like to be able to refer that to him  
7 for the next set of questions.

8 THE COURT: Was that introduced by the government?

9 MS. KLOET: I don't believe so.

10 MR. PRESANT: It was not during his testimony, but we  
11 do have it in our exhibit book so we could bring it up if that  
12 would be helpful.

13 THE COURT: Would you do it, please?

14 MS. KLOET: Thank you.

15 MR. PRESANT: Government's Exhibit 26, I believe.

16 BY MS. KLOET:

17 Q That looks the same to me, Your Honor. So I can continue.

18 THE COURT: And this is the report generated by  
19 Dr. Buckleton in this case.

20 MS. KLOET: Not precisely, Your Honor, but I can have  
21 him identify it for you if you wish.

22 THE COURT: Okay.

23 BY MS. KLOET:

24 Q Dr. Buckleton, can you identify this document?

25 A It's STRmix output.



## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 Q Did you create this personally?

2 A No.

3 Q Okay. Thank you. Do you have any reason to doubt it was  
4 the STRmix report that was generated in this particular case?

5 A No.

6 Q Okay.

7 MS. KLOET: I don't know if you want to stipulate to  
8 that with me since it's your exhibit. That was the report in  
9 fact generated in this case.

10 Your Honor, I have asked the government if they will  
11 stipulate if this was the report generated in this case, seeing  
12 as it was a Government's Exhibit.

13 THE COURT: Mr. Present.

14 MR. PRESENT: I mean we didn't mark it. I think the  
15 Court will hear testimony from another witness that it was  
16 produced in this case. I would rather that witness lay the  
17 foundation for it.

18 MS. KLOET: Dr. Buckleton, I would like to have you  
19 look at page 3, please. What's the title of that page or the  
20 chart on that page, more specifically?

21 THE WITNESS: Per Locus Likelihood Ratios.

22 BY MS. KLOET:

23 Q What does that mean?

24 A That is the likelihood ratio for each locus.

25 Q And when you say locus, you mean each specific spot on the

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 DNA strand that is viewed for purposes of DNA analysis in this  
2 case, correct?

3 A Yes.

4 Q Okay. Were there any loci that were left out of analysis  
5 here?

6 A Yes.

7 Q Which were those?

8 A Can you just expand this and show me loci I think it's 19  
9 and 20 or 18 and 19? So it's DYS391 and D8S1179.

10 Q Okay. Does STRmix or can you tell from this document the  
11 reasons that those two loci were left out of the analysis?

12 A I can't tell from this document, but I otherwise know.

13 Q Okay. Assessing a number of contributors is a necessary  
14 first step to running a STRmix analysis, right?

15 A Yes.

16 Q All right. Now, the number of contributors is always an  
17 estimate, is it not?

18 A Yes.

19 Q Okay. I want to talk a little bit about -- I don't think  
20 we have covered the concept called the analytical threshold.

21 Can you explain to the Court what an analytical threshold is?

22 A Other than the fact that an analytical threshold has  
23 absolutely nothing to do with STRmix. It's a threshold set by  
24 the laboratory below which we ignore the data.

25 Q So it's set by the laboratory. So the laboratory then

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 would be ignoring data under the --

2 A Well, ignoring is a big word. We will not use that data.  
3 We will look at it sometimes for number of contributors  
4 information.

5 Q What is the implication if a number is below the analytical  
6 threshold?

7 A A peak is below?

8 Q Correct.

9 A We won't use it in the analysis.

10 Q Okay. So if the number is below that, the RFU in a  
11 particular allele or peak, as you said, is below the analytical  
12 threshold it could be thrown out?

13 A It will be thrown out.

14 Q It will be thrown out of the analysis. Is it possible that  
15 that low peak could actually be evidence of the presence of  
16 true DNA?

17 A Many of them are exactly that.

18 Q And yet it's thrown out. Correct?

19 A That's correct. And that's not a new policy. That is a  
20 policy that's been in place for well over 20 years and is a  
21 very good policy. It stops us using data that is confusing or  
22 likely to cause issues. Whilst we throw out some good data, we  
23 throw out a lot of bad data.

24 Q I think I heard you testify just now you could possibly  
25 throw out what you characterized as good data.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 A Most of it will be. But some of it is also confusing, bad,  
2 and will derail the process. And this is a very good policy.  
3 It's sanctioned by SWGDAM and every major policy group.

4 Q So could some of that data that is thrown out, so to speak,  
5 could it lead potentially to an underestimation of the number  
6 of contributors in a mixture?

7 A Yes.

8 Q And that in turn could potentially affect the likelihood  
9 ratio generated.

10 A Generally if you get the number of contributors wrong, you  
11 get a conservative likelihood ratio.

12 Q Generally speaking.

13 A Yes.

14 Q Okay. There are competing programs to STRmix, correct?

15 A Yes.

16 Q And isn't it true that some of those programs choose to  
17 incorporate that data below that threshold?

18 A Yes.

19 Q One of those, that program, an example of it would be  
20 TrueAllele, correct?

21 A There are two I know of that do that.

22 Q What's --

23 A TrueAllele is one of them.

24 Q Thank you.

25 THE COURT: What's the other one?

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 THE WITNESS: Lab Retriever, which is spelled like the  
2 dog.

3 MS. KLOET: Thank you. You testified on direct to a  
4 case you were involved in, New York versus Hillary.

5 THE WITNESS: Yes.

6 BY MS. KLOET:

7 Q And that was I believe you testified that STRmix analysis  
8 was not admitted or the likelihood ratio generated by the  
9 STRmix analysis in that case was not admitted, correct?

10 A That's correct.

11 Q Now, in that case they also ran another analysis using  
12 TrueAllele, correct?

13 A Unbeknownst to me, TrueAllele had been run prior to my  
14 involvement.

15 Q You're aware of that now, however?

16 A Yes, very much so.

17 Q So you're aware that that program concluded that in fact  
18 the defendant in that case was excluded from the mixture.

19 A No, that's not so.

20 Q What was the conclusion in that case?

21 A Essentially inconclusive.

22 Q So the conclusion for TrueAllele was inconclusive and what  
23 was your, the STRmix conclusion as to a likelihood ratio?

24 A Am I allowed to answer this?

25 THE COURT: Why would you not be allowed to answer?

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 THE WITNESS: I don't know. It was precluded then.

2 I'm about to give it now. Shall I do so?

3 THE COURT: Yes.

4 THE WITNESS: The likelihood ratio I think was 300,000  
5 from memory.

6 BY MS. KLOET:

7 Q Okay. And that was excluded. Correct?

8 A Yes.

9 Q Thank you.

10 A We have subsequently diagnosed where TrueAllele went wrong  
11 if you're interested.

12 Q Not at this stage, thank you. I would like to move on to  
13 the next chapter. I think we are getting a little bit outside  
14 of the scope of this case.

15 I want to talk about drop-in. Are you familiar with  
16 the concept of drop-in?

17 THE WITNESS: I invented the word.

18 BY MS. KLOET:

19 Q Okay. Can you explain it for us then, please?

20 A Yes. Drop-in relates to the appearance of alleles in a non  
21 reproducible fashion in the electropherogram.

22 Q So in lay person terms, what does that mean, is it a single  
23 allele in the --

24 A We have a model of alleles snowing from the ceiling. So  
25 you imagine that alleles are falling from the ceiling and

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 occasionally fall into your Eppendorf tube. And I can not  
2 spell Eppendorf.

3 Q Is it an Eppendorf --

4 A It's the little plastic thing that we have our extractor.

5 Q So that's something you would find in a lab?

6 A Yes.

7 Q Okay. So is drop-in a form of contamination?

8 A Yes.

9 Q So drop-in could take place in a lab, correct, as you just  
10 described?

11 A It would only take place in a lab. If it happened prior to  
12 the taking of the sample, we wouldn't consider it drop-in.

13 Q And a lab will typically have filters and protocols to  
14 address the risk of contamination, wouldn't it?

15 A Yes.

16 Q Okay. So I just had this document, it's the same one as  
17 before. And you identified it as a report generated by STRmix  
18 in this case.

19 Can you please turn your attention to page 4 of this  
20 document? What's the title of this chart present on this page?

21 THE WITNESS: Parameters.

22 BY MS. KLOET:

23 Q What are parameters?

24 A Is there a hard copy? Because mine is sideways and bleary.  
25 Can I get a hard copy?

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 THE COURT: Should be in the book.

2 THE WITNESS: Is this number 5 or 6?

3 MS. KLOET: It's K in defense exhibit.

4 THE WITNESS: I think we have the equivalent. But can  
5 someone help me?

6 MR. PRESANT: 26 in the government book.

7 THE WITNESS: I'm good, I think.

8 MS. KLOET: You may need the other one going forward.

9 THE WITNESS: I'm good now. Thank you.

10 BY MS. KLOET:

11 Q So we are looking at the same document as before, right?

12 A Yes.

13 Q All right.

14 A I think.

15 Q And you just testified that the title of this chart is  
16 parameters. Can you explain what parameters are, what that  
17 means for purposes of this document, please?

18 A These are the input parameters for STRmix.

19 Q What do you mean by input parameters?

20 A They're the parameters that are input into STRmix.

21 Q Who inputs them?

22 A They usually sit during the laboratory validation and they  
23 are usually locked as a default. If any of them change they  
24 become bold and italic.

25 Q Okay. So are these figures that are input by the local



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1 lab?

2 A Yes.

3 Q Okay. Not by STRmix itself.

4 A No.

5 Q Do some of these parameters have an impact on the STRmix  
6 analysis potentially, not in every case but potentially?

7 A I think nearly all of them would.

8 Q Okay. Fair enough. In the third column, the second row,  
9 there's a parameter called drop-in cap.

10 A Yes.

11 Q What is the value for that?

12 A 400.

13 Q What does that mean?

14 A Peaks above 400 will not be considered drop-in.

15 Q So the converse of that would be peaks below 400 would or  
16 could be considered drop-in, correct?

17 A Would be proposed potentially as drop-in. One of the  
18 proposals.

19 Q Okay. If you can turn to the next page titled Evidence  
20 Input Files. The very first locus listed there is D3S1358.

21 Are there any of the alleles present at this particular locus  
22 that are under the drop-in cap?

23 A Yes.

24 Q Which one is that?

25 A 17.

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 Q All right. How about at the next locus, any under the  
2 drop-in cap?

3 A Yes.

4 Q How many?

5 A Two.

6 Q All right. How about at locus D10S1248?

7 A Two.

8 Q Two. Okay. If I told you there were 11 peaks on this, in  
9 this document that were at or lower than 400, would you have  
10 any reason to question that?

11 A No.

12 Q Okay. So there are 11 peaks that are noted as present here  
13 but in fact potentially could have been drop-in, right?

14 A Yes.

15 Q And your testimony earlier was that drop-in could, is  
16 essentially contamination or could be attributed to  
17 contamination, true?

18 A Yes.

19 Q Okay. Thank you. Back to the page we were just on. Right  
20 under that row we were looking at drop-in cap. I'm looking at  
21 the row entitled drop-in frequency.

22 A Yes.

23 Q What's the value there?

24 A .3453.

25 Q Okay. You said this was a parameter that was inputted by

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 the lab following local validation, right?

2 A Yes.

3 Q So the frequency of drop-in as a result of their own  
4 testing was .3453 or 34.5 percent, true?

5 A Not really.

6 Q What do you mean by not really?

7 A Looks like they fitted the gamma distribution which is a  
8 good idea or an exponential distribution which is a good idea.  
9 So the 3453 may have come from a spreadsheet I made that gets  
10 the tail area correct. But am I right witness for this? I  
11 didn't do any of this work.

12 Q I'm just asking about where you believe those figures came  
13 from and what they signify.

14 A They have come from the internal validation which a  
15 subsequent witness will speak to.

16 Q These are parameters that are used in the software that you  
17 co-developed, correct?

18 A Yes.

19 Q Okay. Thank you. Speaking of contamination, I think you  
20 used the analogy snowing from the ceiling --

21 A Yes.

22 Q -- for how the alleles might arrive in a mixture in a lab  
23 or in a sample in a lab. The DNA can arrive on an object and  
24 therefore in a sample without any sort of direct physical  
25 contact, isn't that true?

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 A Yes, I think that's true.

2 Q Okay.

3 A This has nothing to do with STRmix. Or prob gene or --

4 Q Would you agree it has to do with potential contamination?

5 A Yes. Is that an area you would like to qualify me as an  
6 expert on?

7 Q I believe you're qualified as an expert in forensic science  
8 for purposes of this hearing. So --

9 A I have studied contamination.

10 Q Okay. What I'm getting at, so the DNA that is present in  
11 the sample that was analyzed here could potentially be  
12 explained by, could potentially be there even without direct  
13 contact, isn't that true?

14 A Really there are better witnesses. I don't know the quant.  
15 And I mean you're getting me to say things like possible where  
16 things are, you know, some things are possible but enormously  
17 unlikely.

18 Q Well, drawing upon your experience and expertise in  
19 forensic science.

20 A I haven't studied this case at all. I don't know where the  
21 sample is from. I don't know the quant value. There are  
22 better witnesses for this evidence.

23 Q Okay. Do your best as a qualified expert in forensic  
24 science. My question is, could DNA arrive in a sample without  
25 direct contact between an individual and that sample?

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 A Yes, you could drop blood on something or you could  
2 ejaculate on something or you could spit on something.

3 Q Okay. Thank you. That's as far as I'll take it on that  
4 point.

5 I believe this document was previously displayed to  
6 you but for purposes of the record could you identify it again  
7 please?

8 A It's an e-gram.

9 Q If I told you it was the e-gram or the electropherogram for  
10 this particular case, for the sample taken in this case, would  
11 you have any reason to doubt that?

12 A No.

13 Q Okay. Did you have a chance to review other materials in  
14 this particular case including Mr. Gissantaner's own EPG?

15 A I have seen it. I haven't reviewed it. It was present at  
16 a preparation meeting yesterday. So I've seen it.

17 Q Okay. Did you have -- do you agree that his -- at every  
18 loci that was analyzed here there are some loci where both of  
19 his alleles are not present?

20 A I haven't done that work. But I could it for you, but I  
21 haven't done it.

22 Q Okay. I'm just going to take you from one locus and we  
23 will go from there. So have a look at CSF which is in the  
24 bottom half of this first page, just to the left of the -- I'm  
25 looking at this one right here. So what alleles are present at

## DR. JOHN BUCKLETON - CROSS EXAMINATION - MS. KLOET

1 this locus?

2 A 7, 9, 10 and 11.

3 Q Okay. I'm going to pull up another document quickly. Was  
4 this one of the documents that you had a chance to look at  
5 yesterday?

6 A It was present and I have looked at the blue lane only.

7 Q So if I were to -- would you have any reason to doubt that  
8 this is the EPG for Mr. Gissantaner's reference sample?

9 A No.

10 Q Okay. So let's look at, have a look at this locus right  
11 there. I'm trying to look at CSF. Second circle. Okay. So  
12 this one right here. So what two alleles are present there?

13 A 9 and 12.

14 Q Okay. So that would represent ostensibly the alleles that  
15 Mr. Gissantaner carries at that particular locus, true?

16 A Yes.

17 Q So 9 and 12. Can we go back to the previous exhibit,  
18 please? So if you could look back again at that same locus, I  
19 believe you just agreed that the alleles that are present on  
20 Mr. Gissantaner's EPG were 9 and 12. And you testified earlier  
21 too that the alleles that are present at the same locus are 7,  
22 9, 10 and 11. So there's no 12 present in this sample, is  
23 there, at least as displayed by the EPG?

24 A There is no 12 peak above the analytical threshold.

25 MS. KLOET: Okay. Thank you.

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1 THE COURT: What does that mean?

2 THE WITNESS: There is no peak on which we would  
3 choose to rely for the 12 allele that is concordant with  
4 Mr. Gissantaner's 12 allele. So there are two possible  
5 explanations. The 12 of Mr. Gissantaner has dropped out, or  
6 Mr. Gissantaner is not a donor.

7 MS. KLOET: Are you ready for me to change the  
8 display, Your Honor?

9 THE COURT: Yes, yes.

10 BY MS. KLOET:

11 Q So this is Defense Exhibit K, the comparison report that  
12 you've already identified. Page 3. I would like you to have a  
13 look at page 3, please, which she is about to display. Just a  
14 minute while she orients the page. So I have some highlights  
15 here, but what I would like you to look at is the highlights  
16 under CSF, that locus we were just looking at.

17 A Yes.

18 Q Okay. So at loci CSF, the third column we have there, what  
19 does that represent?

20 A The likelihood ratio for that locus.

21 Q For that particular locus, okay. What's that number?

22 A 4.2.

23 Q Thank you. Now, a likelihood ratio greater than one, what  
24 does that signify?

25 A Support for the prosecution proposition.

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1 Q Okay. So to put it another way, it's an inclusive piece of  
2 information or inclusive likelihood ratio?

3 A That's correct.

4 Q So here you have a likelihood ratio greater than one, and  
5 therefore inclusive at a location where you don't see, as we  
6 just established, all of Mr. Gissantaner's alleles, correct?

7 A Yes.

8 Q If this number, 4.2 was the likelihood ratio at each locus  
9 on the 21 reporting loci, do you have, can you give us an  
10 estimate of what the likelihood ratio would be generated from?

11 A I can give you the exact answer.

12 Q What is that?

13 A It's 4.2 to the pair of 21.

14 Q Okay. That's a 4.2 with 21 zeros after it?

15 A No, not quite. It's about --

16 Q Can you tell us what that is?

17 A Do you want me to do this in my head? I think I can.

18 Q Would it be fair to say that you take the number 4.2 and  
19 you move the decimal 21 places?

20 A About 150 billion.

21 Q 150 billion. Okay. So 4.2, although it seems small has a  
22 pretty large impact on the overall likelihood ratio if it were  
23 carried across all the reporting loci?

24 A Yes.

25 Q 150 billion, is that what your testimony was?



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1 A I'm doing math in my head which isn't a good plan.

2 Q I have a different number but I'll go, they are both quite  
3 large.

4 A Somewhat might have Excel open. They can put it in  
5 quickly.

6 Q But you would agree that's a fairly large likelihood ratio.

7 A Yes.

8 Q And that's generated from a number that's only a couple of  
9 integers above 1, right, at each locus? I'll rephrase. Might  
10 be a confusing question. So what does a likelihood ratio of 1  
11 indicate, is it informative?

12 A No.

13 Q Okay. And here we have a likelihood ratio of 4.2. That's  
14 only 3.2 above an uninformative likelihood ratio number, right?

15 A Well, the answer is yes.

16 Q Okay.

17 A It's a poor, it's a poor thought process.

18 Q But if you were to have that particular, although it's only  
19 a difference of 3.2, at least on a likelihood ratio scale, if  
20 you were to use that 4.2 and input the per locus likelihood  
21 ratio for each one of these rows in this particular column, you  
22 would generate a likelihood ratio statistic at least in the  
23 billions.

24 A Yes.

25 Q Okay. Thank you. You talked about stutter in your direct

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1 exam. I would like to discuss that just a little bit. What is  
2 stutter exactly to refresh, to the extent we didn't already  
3 cover it to refresh the Court's recollection?

4 A Stutter is an artifact of the amplification process.

5 Q What kind of artifact do you mean? How does it manifest?

6 A In Fusion 5C there are three predominant stutters. The  
7 most common is the minus 1 repeat stutter which creates a peak,  
8 one repeat smaller than the allele.

9 Q So I'm sorry to interrupt you. I just want to make sure we  
10 don't get too much at once. So when you say one repeat  
11 shorter, would that mean then if a peak was 12 in order for it  
12 to be, if backward stutter took place as you just described,  
13 there may be evidence of an 11 present?

14 A Yes.

15 Q Thank you. Okay. Go ahead. And you were talking about  
16 three different types of stutter.

17 A The other is forward stutter which is one repeat larger.

18 Q Okay.

19 A And we have a minus 2 base repeat stutter happening at D1  
20 in Fusion.

21 Q Okay. So to summarize, forward stutter is one repeat  
22 longer, backward stutter is one repeat shorter, true?

23 A Yes.

24 Q Okay. And that manifests as an increase in the allele  
25 number that's present in the EPG, if -- potentially if that

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1 took place?

2 A No, it shouldn't. We have got mechanisms in place to avoid  
3 that.

4 Q That's how it could appear, potentially, without those  
5 mechanisms?

6 A If someone were to do forensic science without those  
7 mechanisms, yes, they would get the answer wrong.

8 Q Okay. Thank you. What is forward stutter modeling?

9 A Modeling the forward stutter I spoke of.

10 Q Okay. When you say modeling, what does that mean?

11 A We essentially predict a peak height for forward stutter  
12 and compare it with the observed peak height and do our  
13 standard calculation for the probability of that occurrence.

14 Q Okay. Thank you. Did the version of STRmix that was used  
15 in this case, 2.3.07, take into account the possibility of  
16 forward stutter?

17 A No.

18 Q Do the later versions of STRmix including the one you're  
19 currently developing take into account that possibility?

20 A Yes.

21 Q Thank you. So I'm going back to the electropherogram for  
22 the sample in this case. If you could turn to page 2. I would  
23 like you to look at this second column of boxes here. So the  
24 second column of boxes, I'm referencing to the left of that  
25 line there, those are the alleles present at locus D12S391,

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1 correct, as they appear on the electropherogram?

2 A Yes.

3 Q Okay. The 19 peak here, the 19 allele is, the RFUs, or the  
4 peak height as you described it earlier, are 4649, true?

5 A Yes.

6 Q The 20 peak just below it or just next to it, would be, I'm  
7 not saying this specifically, but a 20 peak could be in forward  
8 stutter position to the 19 peak.

9 A It is in the forward stutter position.

10 Q Okay. Thank you. But by comparison to 19 the amount of  
11 RFUs at 19 which we just established was 4649, the RFU at 20  
12 are quite low at 648 in height.

13 A Yes.

14 Q So potentially the 20 that's present there could be forward  
15 stutter to the 19 that's present in larger amounts.

16 A No.

17 Q Your testimony --

18 A You would never get a forward stutter that big.

19 Q Why do you say that?

20 A It's almost always less than two percent of the parent.  
21 But it is also in the back stutter position of the 21.

22 Q The 20 you mean?

23 A Yeah, it's between the 19 and the 21.

24 Q So is it your testimony today it's absolutely impossible?

25 A It's absolutely impossible for that 20 peak to be all

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1 forward stutter.

2 Q Okay. How about we look at peak 21. Now, that particular,  
3 the RFU at that particular peak are 1970, correct?

4 A Yes.

5 Q And the 21 peak is or the 20 peak is in backward stutter  
6 position to that 21 peak, right?

7 A Yes.

8 Q Is it possible that that 20 peak is a sum of the forward  
9 stutter from 19 and the back stutter of 20?

10 A I have to go and do some math. I would say -- see I don't  
11 have the stutter ratios for D12 in my head but I'll just try  
12 and do it. Really why are you making me do mental arithmetic  
13 in court? Why haven't we done prepared work on this?

14 MR. PRESANT: Your Honor, I'm going to lodge an  
15 objection now on that basis which is he has already testified  
16 that he has not reviewed the specific work done in this case.  
17 The government is going to call a witness later on who has done  
18 the work in this case and can testify about these particular  
19 electropherograms. I think Ms. Kloet has had a lot of leeway  
20 to question Dr. Buckleton about these issues, but I think her  
21 examination would be better focused on how the software  
22 functions as opposed to what was done in this particular case  
23 because he hasn't reviewed it. It's not fair to make him do  
24 that on the stand.

25 THE COURT: Ms. Kloet.

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1 MS. KLOET: Well, Your Honor, this is information  
2 that's incorporated into the software program that  
3 Dr. Buckleton created himself. This is -- he's familiar with  
4 the parameters. I'm asking him to simply read the numbers that  
5 everyone in the courtroom can review. And he's familiar as a  
6 forensic science expert about what, of concepts of forward and  
7 backward stutter. The question I just asked didn't require him  
8 to do mathematics. I just asked him if it was possible under  
9 the theories and principles of forensic, of forward and  
10 backward stutter that this particular allele in the amount  
11 that's there could potentially be a combination of forward and  
12 backward stutter. Not conclusively yes or no, just  
13 potentially. I don't think that requires math.

14 MR. PRESANT: Well, I think the testimony is he would  
15 have to refer back to other materials in order to say  
16 conclusively. So I don't think there is a lot of probative  
17 value in the question. Is it something possible hypothetically  
18 or conceivably. I think she should ask the witness what he  
19 knows about and what he is prepared to testify about here  
20 today.

21 THE COURT: I think you need to move on, Ms. Kloet. I  
22 really do. I think you are getting a little bit deep in the  
23 woods here with regard to Dr. Buckleton's expertise and the  
24 meaning of these documents which he did not produce.

25 MS. KLOET: I'll move on, Your Honor. And I can ask

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1 another witness to hopefully answer some of those questions  
2 that he's not in a position to do today.

3 Based on your -- so is it your testimony for purposes  
4 of clarification that you have not reviewed the EPGs in this  
5 case or you just did briefly yesterday?

6 THE WITNESS: I saw them. I don't think I could say I  
7 reviewed them.

8 BY MS. KLOET:

9 Q Okay. Can you pull up J, please? You are familiar with  
10 what a STRmix report looks like, correct?

11 A Yes.

12 Q General format. Okay. I hope so. And you're aware to the  
13 extent you have some familiarity and from the cover page of the  
14 document I'm displaying here that the determination of the  
15 number of contributors here was three, right?

16 A Yes.

17 Q Okay. No reason to dispute that.

18 A No.

19 Q Okay. Or at least that determination.

20 So what is this document that I'm looking at here?

21 A That's the opening page of a STRmix output.

22 Q Okay. And if you see towards the top under the STRmix  
23 brand stamp there is a comments. It says deconvolute. What  
24 does that mean?

25 A Mine is different from yours.

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1 THE COURT: Are you on Exhibit J in the defense book?

2 THE WITNESS: I must not be. I think I'm sorted now,  
3 thank you. In any case, deconvolute is, tends to mean exactly  
4 what it says, it's asking STRmix to deconvolute the mixture.

5 BY MS. KLOET:

6 Q And by deconvolute, could you just break it down for us?

7 A It's the process I spoke of earlier which is essentially to  
8 run the Markov Chain and ascertain those sets of genotypes that  
9 could plausibly explain the mixture.

10 Q Okay. And on this front page there is a chart entitled  
11 Summary of Contributors, correct?

12 A Yes.

13 Q And in that chart there is a row entitled mixture  
14 proportions.

15 A Yes.

16 Q What does it say as to the proportion of the mixture  
17 contributed by 1, what is the figure there?

18 A 68.

19 MR. PRESANT: Same objection, Your Honor. The witness  
20 didn't prepare this document. If Ms. Kloet has questions about  
21 how the software works or why it generates a document like  
22 this, I think those are fair for Dr. Buckleton. The document  
23 speaks for itself and there will be other witnesses who did  
24 prepare the document who will testify about what it means.

25 THE COURT: I think she is heading in that direction,



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1 Mr. Presant. And he can obviously relate what is on the page.

2 MS. KLOET: I am, Your Honor. I don't expect very  
3 many more questions on these particular documents. With  
4 respect to contributor 2, what's the proportion of the mix?

5 THE WITNESS: 25.

6 BY MS. KLOET:

7 Q And contributor 3?

8 A 7.

9 Q Okay. Dr. Buckleton, do you recognize this document?

10 A Yes.

11 Q What is it?

12 A This is the raw output from STRmix.

13 Q The raw output you said?

14 A Yes.

15 Q If I could call your attention to the first page, the  
16 section entitled contributor order giving highest likelihood  
17 ratio.

18 A Yes.

19 Q Do you agree that this report generated by STRmix tends to  
20 indicate the strongest support for the sample labeled  
21 LS15-3777-2AX as contributor 3?

22 A Yes.

23 Q So if I were to tell you that 2AX represented  
24 Mr. Gissantaner, would you agree that the strongest likelihood  
25 ratio for him would be at contributor 3 according to this

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1 report?

2 A Yes.

3 Q Okay. Thank you. Earlier in your testimony you referenced  
4 diagnostics, is that true?

5 A Yes.

6 Q And STRmix generates several diagnostics. What was their  
7 purpose?

8 A To help diagnose the performance of the software in this  
9 particular run.

10 Q So it can help tell the analyst whether or not the run was  
11 good, I guess, for lack --

12 A Yes.

13 Q And the one you testified to earlier was the Gelman-Rubin  
14 diagnostic?

15 A Yes.

16 Q Can you just roughly describe what that means?

17 A Have all the different chains gone to the same places.

18 Q Okay. I guess I lied. I had one more reference to this.  
19 So back to J. So this is the document I was just showing you  
20 that the STRmix report that we went over with the contributors  
21 listed. Under the section entitled Run Information, is there  
22 any information about the Gelman-Rubin diagnostic you just  
23 explained?

24 A Yes.

25 Q What's the figure for that?

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1 A 1.41.

2 Q 1.41. Is that a potential warning indicator that this may  
3 have not been a good run?

4 A It's above 1.2 which is a limit many people would use.

5 Q So if it's above 1.2, then potentially this could indicate  
6 there was an issue or concern with the run?

7 A With running it for longer.

8 Q A lab can run STRmix more than once, right?

9 A Yes.

10 Q Okay. Thank you. I want to talk about the validation  
11 studies that you covered pretty extensively. I'm not going to  
12 cover them as extensively. You mentioned SWGDAM. SWGDAM has  
13 published guidelines, right?

14 A Yes.

15 Q But guidelines aren't the same as standards, are they?

16 A There are no standards.

17 Q What is the difference?

18 A To some extent standards are mandatory. Whereas guidelines  
19 are not.

20 Q Okay.

21 A But for all intents and purposes, SWGDAM guidelines are  
22 mandatory in the United States.

23 THE COURT: Would it be fair to say that a guideline  
24 is more like a range of behavior or --

25 THE WITNESS: Yeah.

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1 THE COURT: -- values as opposed to a standard which  
2 is a single --

3 THE WITNESS: Yes.

4 THE COURT: -- statement.

5 THE WITNESS: Yes, that's well put.

6 BY MS. KLOET:

7 Q When was the STRmix software first commercially available  
8 in the United States?

9 A January 2014.

10 Q And when were the SWGDAM guidelines published?

11 A Can you check for me? I think it's July 2015.

12 Q That sounds about right. I have June.

13 A It could be June.

14 Q So you completed the developmental validation or engaged in  
15 a significant amount of it and sold the product in the United  
16 States but in the absence of formal standards under SWGDAM.

17 A Yes.

18 Q Okay. Thank you. And when SWGDAM eventually did issue  
19 those guidelines, didn't they specifically instruct not to  
20 apply those guidelines retroactively?

21 A They may have. I think they usually do that. But it has  
22 no, it has no traction. A Court can deem that it should be  
23 taken cognizance of whether SWGDAM thinks so or not.

24 Q Okay. Talking about the peer reviewed publications in this  
25 case. The peer reviews of these validation studies of yours

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1 did not involve a duplication of the exact tests that you  
2 completed on the STRmix program, correct?

3 A No.

4 Q So they were an evaluation of the studies or tests that you  
5 completed, true?

6 A They usually about paper exercise. So they actually get  
7 the paper electronically and read it. Very few people actually  
8 repeat the calculations, but I do tend to do that, but most  
9 referees do not.

10 Q Okay. Thank you. The internal validations that you  
11 referenced, you indicated that Nathan Adams is the only  
12 individual who has reviewed the source code.

13 A Yes.

14 Q So impliedly then the Michigan State Police didn't review  
15 the source code during their validation.

16 A No, they did not.

17 Q Okay. Someone who has to review the source code would have  
18 to get permission from ESR, is that true?

19 A Permission is automatic on signing of the NDA, so they  
20 don't need to get specific permission.

21 Q Okay. I mean you don't make it publicly available.

22 A No, we don't.

23 Q Do you recognize this document, Dr. Buckleton?

24 A Just give me a minute, please. Yes. This is our access to  
25 STRmix that appears on the STRmix web page.

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1 THE COURT: We are at C?

2 MS. KLOET: CC, two Cs. All right. So this is a  
3 3-page document, right?

4 THE WITNESS: Yes.

5 BY MS. KLOET:

6 Q On the first page I would like to call your attention to  
7 the fourth full paragraph. It begins, "Where STRmix has been  
8 used."

9 A Yes.

10 Q Okay. So this paragraph delineates what's available for  
11 inspection, true, for defense review?

12 A This delineates what we would automatically hand over.

13 Q Okay.

14 A We would also hand over extraneous material if requested  
15 and if our lawyers allowed us to.

16 Q Okay. Do you agree that there are four items listed in  
17 this bulleted list in that paragraph?

18 A Yes.

19 Q And that's the source code, a limited trial version,  
20 developmental validation records, and the user's manual,  
21 correct?

22 A Yes.

23 Q Github repository is not on that list, is it?

24 A No.

25 Q You charge defense to do this review, don't you?

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1 A No.

2 Q ESR charges defense to do this review.

3 A No.

4 Q So is it your testimony today that if defense counsel  
5 requested this information that that would be free?

6 A I think you have to pay the costs of the supervision and it  
7 doesn't go to ESR at all. And an installation fee by the  
8 installer of the software and that doesn't go to ESR at all.

9 Q What if I told you it was \$100 an hour to access the source  
10 code.

11 MR. PRESANT: I'm going to object on relevance  
12 grounds, Your Honor. I think this is a Daubert hearing about  
13 the reliability of the software. Dr. Buckleton developed the  
14 software. I think he's testified already today that he doesn't  
15 handle the business end of it. He's certainly not the lawyer  
16 for ESR. I'm not sure there has even been a foundation that he  
17 developed this document. And I don't understand the relevance  
18 of it considering the code review has already taken place and  
19 the Court is going to hear testimony about that in order to  
20 determine the issue here which is whether or not the software  
21 is reliable.

22 THE COURT: I don't understand the relevance either,  
23 Ms. Kloet.

24 MS. KLOET: Your Honor, whether the software has been  
25 reviewed and validated and the extent of those reviews and

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1 validation goes directly to how accessible this program is.  
2 And I believe Dr. Buckleton has already testified that there  
3 are some open source and previous software versions for  
4 probabilistic genotyping software, and his position previously  
5 was that this be allowed open source. So I think it goes  
6 directly to access, which goes directly to whether or not it's  
7 been sufficiently validated and tested. And as he -- I'll  
8 stop there.

9 THE COURT: Well, it strikes me that whether it is  
10 free for purposes of validation is irrelevant. The question is  
11 has it been validated independently of Dr. Buckleton and the  
12 company for which he works, or the agency for which he works.  
13 Right?

14 MS. KLOET: The question is the breadth of the  
15 validation, the depth and the breadth, as it applies to  
16 different mixtures from independent review, and his testimony  
17 tended to suggest today that the review was in fact done  
18 internally. So access to the source code would enable  
19 independent reviewers to identify issues or problems in the  
20 coding that might manifest themselves during the operation of  
21 the program itself.

22 THE COURT: Well, is it your position then that  
23 charging a hundred dollars an hour is somehow limiting  
24 independent review? Why don't you just ask him, has, have  
25 there been independent reviews of this software including the



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1 source code. Isn't that really the question?

2 MS. KLOET: I think he's testified to that today, Your  
3 Honor, that Mr. Adams has done that and he's the only one. So  
4 I can move on to the next set of questions.

5 THE COURT: Okay.

6 MS. KLOET: My point was to emphasize the lack of  
7 access.

8 G. Dr. Buckleton, in 2008 you coauthored an article  
9 about the likelihood ratio and the random man not excluded as  
10 means of presenting evidence. Isn't that true?

11 THE WITNESS: Yes.

12 BY MS. KLOET:

13 Q Is this the article that you authored?

14 A Yes.

15 Q Now, in the article fair to say that you weighed these two  
16 approaches of presenting evidence against each other, right?

17 A Yes.

18 Q And in fact you came to two conclusions: One of those was  
19 that likelihood ratios are different -- difficult to present in  
20 court.

21 A Yes.

22 Q Specifically, if you would like to follow along, on page  
23 344, in the second column, second paragraph, can you read the  
24 last paragraph or last sentence, pardon me, for me starting  
25 with there is.

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1 A I stand no chance of reading this at the moment. Can this  
2 be made bigger?

3 THE COURT: Can you look at it in the book?

4 THE WITNESS: Maybe I could. What is it?

5 THE COURT: It's G.

6 MS. KLOET: Here we go. Exhibit G. The final  
7 paragraph, final sentence in that paragraph, could you read  
8 that for me, please?

9 THE WITNESS: Yes. "There is considerable evidence  
10 that likelihood ratios are harder to understand and that they  
11 may be slightly more prone to the prosecutor's fallacy."

12 BY MS. KLOET:

13 Q Okay. Thank you. The paragraph right below that, if you  
14 could pull that up, please. Can you in the middle of the  
15 paragraph you see the word furthermore. Could you read that  
16 sentence?

17 A "Furthermore, if likelihood ratios lead to better  
18 scientific decision making then they should be used."

19 Q What's the next sentence?

20 A "Whether they are then presented to court is a secondary  
21 decision."

22 Q Thank you. This was an article that you coauthored,  
23 correct?

24 A Yes.

25 Q I'm just going to ask this final question and I think it's

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1 done. It's not related to this document necessarily so you can  
2 pull it down.

3 What is a conditioning profile?

4 THE WITNESS: A conditioning profile is a profile that  
5 can reasonably be assumed to be present under both the  
6 prosecution and defense scenario.

7 BY MS. KLOET:

8 Q Okay. Could there be more than one conditioning profile?

9 A Yes.

10 Q So does that mean if there's an additional reference sample  
11 added in the analysis that it would impact the outcome, the  
12 outcome of an analysis potentially?

13 A Yes.

14 Q Would it tend to increase its reliability if you knew for  
15 certain who else was in a mixture?

16 A They are all reliable. It would increase its ability to  
17 discriminate true from false contributors.

18 Q Okay.

19 MS. KLOET: Thank you. That's all I have, Your Honor.

20 THE COURT: Any redirect, Mr. Presant?

21 MR. PRESANT: Thank you, Your Honor.

22 REDIRECT EXAMINATION

23 BY MR. PRESANT:

24 Q Dr. Buckleton, Ms. Kloet asked you some questions about the  
25 IEEE and you said it would be helpful if you could refer to the

1 manual.

2 A Yes.

3 Q Do you recall that?

4 A Yes.

5 Q I wanted to offer you the opportunity if you want to see  
6 anything in the manual.

7 A Only if you can get me directly to the independence clause  
8 which I think we may meet. I may have brought it to your  
9 attention yesterday. I can't remember. I don't think it's  
10 page 17, and I think you only printed to there.

11 Q May I approach, Your Honor?

12 THE COURT: Yes.

13 MR. PRESANT: I don't think I can get you there but  
14 I'll give you the opportunity to do it. If it's not important  
15 we will move on.

16 THE WITNESS: All right. Perhaps I can try and answer  
17 your next question while I look.

18 BY MR. PRESANT:

19 Q Ms. Kloet also asked you some questions about the  
20 analytical threshold and then some subsequent questions about  
21 drop-in and drop-out. You recall those?

22 A Yes.

23 Q She asked you a number of questions about drop-in/drop-out  
24 stutter. Is it fair to say those are all biological phenomena?

25 A They are all biological phenomena. They are not peculiar

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1 to STRmix and they have been in existence since the inception  
2 of DNA analysis.

3 Q Do you think when you're building a model that reflects the  
4 existence of those phenomena it's necessary to have training in  
5 forensic analysis or forensic biology in order to be able to  
6 understand how they should properly be modeled?

7 A I think it's advantageous, yes.

8 Q Now, you also testified I believe that the analytical  
9 threshold is not an issue for STRmix.

10 A It's not an issue peculiar to STRmix. We have had  
11 analytical thresholds in the United States again since the  
12 inception. And they are highly accepted by courts all over  
13 America, and it's just standard usage.

14 Q And STRmix uses analytical thresholds.

15 A Yes.

16 Q Ms. Kloet asked you a series of questions about  
17 contamination being source of drop-in. Are there other causes  
18 of drop-in besides contamination?

19 A Drop-in we think are fragments of cells present in the  
20 laboratory often after the cleanup process. It's a very rare  
21 phenomenon, and it is a form of contamination.

22 Q But it's not necessarily mishandling of evidence  
23 contamination.

24 A No. It's good sensitivity. It's almost impossible to  
25 completely get rid of. And it's reasonably innocuous. It's

1 single alleles, and it would be almost inconceivable they could  
2 ever build to form any form of false inclusion.

3 Q Ms. Kloet asked you about the drop-in threshold of 400 I  
4 believe it was.

5 A Yes.

6 Q How did you come up with that number, 400, or did you come  
7 up with that number?

8 A I think MSP would have come up with it. And it tends to be  
9 a number higher than the highest drop-in they have seen.

10 Q That's because it's specific to the laboratory where the  
11 work is being conducted.

12 A Yes, yes.

13 Q Just to be clear, STRmix in fact models for the different  
14 biological phenomenon we just covered, drop-in, drop-out and  
15 stutter, those are all things that are incorporated into the  
16 mathematical model?

17 A Yes. This version models only back stutter, not forward  
18 stutter.

19 Q Ms. Kloet also asked you about the particular data in this  
20 case of an example of drop-out or that 12 allele I believe that  
21 dropped out, right?

22 A Well, it dropped out if it's from Mr. Gissantaner, and we  
23 shouldn't make the assumption it is from Mr. Gissantaner.  
24 That's the question, not the conclusion.

25 Q But the likelihood ratio models both of those

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1 possibilities, that it is from him and that it is not, correct?

2 A Absolutely. That's exactly what it does. It's weighed  
3 those against each other, and in their particular locus, the  
4 colony specific factor locus which we were speaking of, it's  
5 the rarity of the 9 allele that's driving that locus specific  
6 allele of 4.20.

7 Q She also asked you a series of questions about 4.2 being  
8 close to 1, and the product rule getting you to a number in the  
9 billions. And I believe you started an answer saying that  
10 wasn't a logical way to think about it. I just wanted to give  
11 you an opportunity to explain why that is.

12 A Sure. So 4.2 could be viewed as 3.2 bigger than 1, or over  
13 4 times 1. And it's the multiplier I ask you to think of. So  
14 if I could lower your chance of developing cancer by a factor  
15 of 4, would you call that immaterial?

16 Q I wouldn't, no.

17 A Well, I would suggest you shouldn't. It's a massive  
18 factor.

19 Q And if you could do that 21 times that compounded on one  
20 another.

21 A If you could get a factor of 4 in 21 major diseases, I  
22 would take it.

23 Q Now, she also asked you about this diagnostic being 1.41.

24 A Yes.

25 Q You said a commonly used threshold is 1.2.

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1 A Yes.

2 Q Is that a mandatory threshold?

3 A No, it is not. It's a soft threshold. Recall this is a  
4 convergence diagnostic, not a has it run properly diagnostic.  
5 So you can get the right answer from something with 1.41, and  
6 often more complex mixtures do have higher GRs.

7 Q And I think you started to say something along the lines of  
8 well it could have run for longer.

9 A Yeah.

10 Q What did you mean by that?

11 A You can set STRmix to run for longer.

12 Q So if someone were unhappy with that particular number,  
13 they could choose to run it again, run for longer and that  
14 diagnostic might get lower?

15 A It would get lower.

16 Q But that's a judgment call that whoever is running it has  
17 to make.

18 A We have done a fairly massive trial so we have picked on  
19 GRs that were of the sort of 1.4 and then run them for longer,  
20 and the GR does come down and the likelihood ratio seldom moves  
21 at all. So I would predict if you ran this for longer the GR  
22 would come down but the likelihood ratio would be similar.

23 Q Finally, Ms. Kloet showed you sentences out of context from  
24 that 2008 paper regarding likelihood ratios. I wanted to give  
25 you a chance to elaborate on that. Has your thinking on



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1       likelihood ratios changed since 2008?

2       A     No. They are not so out of context, to be fair to  
3       Ms. Kloet. I think I just accept that presenting likelihood  
4       ratios is difficult. The wording is very awkward. Her Honor  
5       has very correctly picked up on this. It is awkward. And it  
6       is an area which were we to go to trial we could give some  
7       proper attention to. I spend a lot of my time thinking about  
8       how to present this evidence.

9       Q     But the bottom line opinion you have is that it is useful  
10       evidence that can be presented to a jury in court?

11       A     Likelihood ratios are so much more powerful than other  
12       methods. We spoke earlier about this particular case and what  
13       represented certainty. If we had done this in the olden days  
14       with CPI, it would have been completely impossible to interpret  
15       this profile. This profile, the CPI is such a blunt tool it  
16       would have not been able to interpret this profile. We now  
17       have a powerful tool that can produce a reliable statistic for  
18       this type of profile. So we are obligated both in the  
19       interests of victims and falsely accused people to try and  
20       present this powerful evidence properly.

21       Q     In the best way you can.

22       A     In the best way we can in conjunction with the legal  
23       participants to do the best job we can.

24               MR. PRESANT: Thank you, Your Honor.

25               THE COURT: Ms. Kloet. Any recross?

1 MS. KLOET: Your Honor, I don't believe I have any  
2 recross. But I did want to address the issue of exhibits. The  
3 witness identified the six exhibits that I offered in the  
4 course of my cross-examination of him. Three of them have  
5 already been part of the record through the motions and  
6 responses filed. That's Exhibit J, H, K. The other three  
7 which is CC, G and F are not part of the record and I would  
8 move to admit those now seeing as they have been identified and  
9 discussed on the record.

10 THE COURT: Mr. Present.

11 MR. PRESENT: What were those again?

12 MS. KLOET: CC, G and F. Those are the three that are  
13 not in the record and the other three are the EPGs and the  
14 STRmix reports.

15 MR. PRESENT: CC and G the government is fine with. I  
16 think F the foundation hasn't been laid yet. But I think the  
17 foundation, I think it will come in through another witness.  
18 But he didn't create it so I don't think he can testify that it  
19 was the one used in this case. If she wants to admit it  
20 simply --

21 THE COURT: Did you say F?

22 MR. PRESENT: F I believe, yes. I mean he can I think  
23 if it's just being admitted right now for the purpose of saying  
24 this was, this looks like something that would be output by  
25 STRmix, that's fine. But another witness is going to have to

1       testify to what it is. And it's marked in the Government's  
2       Exhibit book too. So for all intents and purposes it can come  
3       in. I just want to be clear that he hasn't testified this is  
4       what was done in this case.

5               THE COURT: CC and G then are admitted without  
6       objection. And F I don't think it is properly offered at this  
7       time. So let's wait until we get the proper witness in front  
8       of us. Okay?

9               MS. KLOET: Okay. Thank you.

10              THE COURT: Before I excuse you, Dr. Buckleton, I want  
11       to, first of all, take a quick look at my notes.

12              In terms of, well, first of all, under Daubert it's  
13       the duty of the Court to determine the reliability of the  
14       evidence. And if I understand, again what limited reading I've  
15       been able to do in this area, there are for purposes of  
16       addressing the jury, we have to talk about how was the sample  
17       collected, how was it handled after it was collected, and then  
18       how was it analyzed in the lab and using the software that's in  
19       question here, STRmix. Do you agree with all of that?

20              THE WITNESS: I'm not certainly not going to debate  
21       with Your Honor the legal interpretation of Daubert.

22              THE COURT: Okay. Well but in interpreting the  
23       results that are going -- assuming the evidence is deemed to be  
24       admissible and relevant, and not unduly prejudicial, in  
25       interpreting the results that are going to be presented, those

1 areas have to be independently addressed by the testimony and  
2 the evidence.

3 THE WITNESS: Yes.

4 THE COURT: Okay. And they should lead to a question  
5 or an answer to the question of are these results reliable  
6 based on existing scientific principles.

7 THE WITNESS: Yes.

8 THE COURT: And your testimony is that they are. That  
9 these, that when we look at, at least from your perspective,  
10 when we look at what was done in this case, you don't have any  
11 opinion with regard to the collection, you have no opinion with  
12 regard to the handling, but you do have an opinion as to the  
13 analysis that was done leading to the probabilistic figure of  
14 49 million to 1.

15 THE WITNESS: Yes.

16 THE COURT: That is exclusively where your areas of  
17 expertise come into play in this case.

18 THE WITNESS: Yes.

19 THE COURT: And you are satisfied to the best of your  
20 scientific knowledge that these results are reliable.

21 THE WITNESS: Yes.

22 THE COURT: Okay. Now, the one thing that I am still  
23 not entirely clear on based on what I've read is this idea of  
24 the interpretation of the results. Could you please speak to  
25 that?

1           THE WITNESS: Yes. So I have in the break been able  
2 to clarify that the FBI have stopped doing source attribution,  
3 so they do not say this DNA came from him anymore. When they  
4 did do it, their number was 700 billion. That was the number I  
5 said I would try and find for you. And even then they produced  
6 the number first and then, so they have always tried to produce  
7 a statistic. I won't go into any depths but this case would  
8 have been very hard to interpret without the modern software.

9           But if we come to the concept of what does 49 million  
10 mean. 49 million should be combined with the other evidence,  
11 and that is not my job to do. I do not know whether there is  
12 any other evidence or whether there's evidence that points  
13 either towards or away from Mr. Gissantaner. I have no idea.

14           If the other evidence were neutral, then you multiply  
15 that by 49 million and the odds are now 49 million to 1 that  
16 this DNA came from Mr. Gissantaner.

17           But if the odds are not neutral, if there is massive  
18 evidence in his favor, or if he's plucked randomly from the  
19 street as being one in a million people, then you should start  
20 from a position of 1 in a million and multiply that by 49  
21 million, and that comes to simply 49 to 1.

22           I'm certainly not going to tell you how to interpret  
23 the other evidence. I don't even know what that is. But you  
24 must form that view of what the other evidence is, combine it  
25 with the 49 million, and then you get the overall value.

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1 THE COURT: But my question is this. Again, based on  
2 the reading that I've done suggests that there is a certain  
3 amount of interpretation of the data that is done when these  
4 results are produced; not, not interpretation for the jury to  
5 make or for me to make, but the people who produce these  
6 results do some individual interpretation that may be  
7 subjective.

8 THE WITNESS: Yes. So that it is subjective. So it's  
9 utterly routine. It's been happening for years. And it's not  
10 to do with STRmix. The subjective elements are some artifact  
11 management, so that is removal of spikes, and pull up, and  
12 forward stutter. These are artifacts of the PCR in imaging  
13 process, and this is standard stuff. It's been happening for  
14 years. And we all follow the SWGDAM guidelines on how to do  
15 it.

16 Then the other one is assigning a number of  
17 contributors. When you assign a number of contributors you are  
18 either correct or incorrect. If you're correct, then you are  
19 correct. If you are incorrect, you produce a conservative  
20 number. So there is nothing bad that can happen by getting the  
21 number of contributors wrong. You simply get additional  
22 conservativeness.

23 THE COURT: Okay. I think I understand. And that's  
24 all the questions I have. Thank you, Doctor. You may step  
25 down.

JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 THE WITNESS: Thank you, Ma'am.

2 THE COURT: Mr. Presant.

3 MR. PRESANT: The government calls Jeffrey Nye.

4 JEFFREY NYE, GOVERNMENT WITNESS, WAS DULY SWORN

5 THE LAW CLERK: Please be seated. And state your full  
6 name for the record, spell your last name.

7 THE WITNESS: Full name is Jeffrey Burn Nye. Last  
8 name is spelled N-Y-E.

9 DIRECT EXAMINATION

10 BY MR. PRESANT:

11 Q Mr. Nye, where do you work?

12 A I work for the Michigan State Police Forensic Science  
13 Division.

14 Q What's your current position with the Michigan State  
15 Police?

16 A My current position is the assistant director of the  
17 Forensic Science Division.

18 Q Let me bring up Exhibit 2, please, Ms. Miller. Do you  
19 recognize 2?

20 A Yes, I do.

21 Q What is it?

22 A My curriculum vitae.

23 MR. PRESANT: Government moves to admit 2, Your Honor.

24 THE COURT: Ms. Kloet, any objection to Mr. Nye's CV?

25 MS. KLOET: No, Your Honor. I have seen it.

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 THE COURT: It's admitted.

2 BY MR. PRESANT:

3 Q As we follow along here, Mr. Nye, would you please describe  
4 for the Court your educational background?

5 A Certainly. I have a Bachelor of Science Degree in  
6 Biochemistry from Michigan State University. I have a Master's  
7 Degree in Crop and Soil Sciences from Michigan State  
8 University. And then I also have a specialization, another  
9 Master's in Environmental Toxicology, and then I have an  
10 additional course in molecular biology from Lansing Community  
11 College.

12 Q What did you do after you finished your graduate work in  
13 1995?

14 A After I finished my graduate work I worked for a company  
15 called Michigan Biotechnology Institute. Essentially that  
16 organization would take laboratory research from universities  
17 and scale them up and if we could prove that they were viable  
18 corporations or companies around that, then we would spin them  
19 out as private companies. So research.

20 Q And then here at the bottom we pick up in 1996.

21 A Yes.

22 Q And that's when you moved to the laboratory at the state  
23 police?

24 A That's correct.

25 Q And have you been there ever since in various capacities?



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1 A I have.

2 Q What are the various positions you've held with the  
3 Michigan State Police?

4 A I started out as a forensic scientist conducting DNA  
5 testing at the Lansing laboratory. I did that for a number of  
6 years, then I promoted to a unit supervisor where I oversaw  
7 other forensic DNA examiners. Did that for a number of years,  
8 then I promoted to a DNA technical leader position which is  
9 sort of a quality assurance manager for that discipline with  
10 respect to training and validations and things of that nature.  
11 I did that for approximately nine to nine and a half years.  
12 And then about two years ago I promoted to the assistant  
13 director for the Forensic Science Division.

14 Q What are your responsibilities as the assistant director  
15 for forensic science?

16 A So as I described my position before that, it was as a  
17 technical leader for the DNA discipline. Forensics within the  
18 Michigan State Police there is a number of different  
19 disciplines: Firearms, controlled substances, all the  
20 different forensic disciplines. Each discipline has a  
21 technical leader. And all those technical leaders report to me  
22 as the assistant division director and quality assurance  
23 manager.

24 Q What's involved in being the quality assurance manager?

25 A Quite a bit. So we as a laboratory system are accredited

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1 to certain standards and guidelines. And it's to ensure that  
2 our operation, which is eight laboratories and approximately  
3 260 scientists and technicians, comply with standards and we  
4 meet those accreditation standards, and then also to establish  
5 policies and procedures as far as how our operation operates  
6 and complies with those standards.

7 Q The Court has heard testimony today about a forensic  
8 governing body called SWGDAM. Are you familiar with SWGDAM?

9 A I am.

10 Q How are you familiar with it?

11 A I am a member of SWGDAM.

12 Q Would you describe for the Court what the structure is of  
13 SWGDAM and what its role in the forensic science community is.

14 A So by congressional act, SWGDAM is sponsored by the Federal  
15 Bureau of Investigation. And they convene twice per year for  
16 about a week at a time, January and July of each year, a  
17 variety of experts from around North America and then some  
18 international guests as well. The spectrum basically runs the  
19 gamut of practitioners like myself, researchers, a whole host  
20 of individuals basically to get together to address current  
21 concerns within forensic DNA and biology testing to help  
22 develop guidelines and standards specific to that discipline.

23 Q How many people sit on SWGDAM?

24 A Roughly I would say between 40 and 50 individuals.

25 Q And that's primarily in the United States but also from the

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 whole world?

2 A Correct. There are also other invited guests. There is a  
3 distinction between being an invited guest and being a member.  
4 Invited guests are able to contribute to the work product, but  
5 the members actually vote on accepting the final work product.

6 Q So if there are only 50 total then every state laboratory  
7 doesn't have someone who is a member of SWGDAM, correct?

8 A That's correct. They work very hard to make sure they  
9 represent the full range of laboratories within the United  
10 States. So there are federal laboratories such as the FBI or  
11 the Army crime lab or ATF, there is state laboratories that are  
12 represented, then there is also local laboratories  
13 geographically distributed as well as size distribution as far  
14 as how big of an operation that they have.

15 Q How does SWGDAM decide who should be invited as a member?

16 A Probably by recommendation. And I believe that they have a  
17 separate committee that votes on those recommendations as to  
18 extend an offer of an invitation for an invited guest or to  
19 offer somebody as being a member.

20 Q How long have you been a member?

21 A Goodness. Eight or nine years, I'm going to guess.

22 Q And you're a voting member so you vote on standards?

23 A I am.

24 Q Bring up Exhibit 19, please. Do you recognize 19?

25 A I do.

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1 Q What is it?

2 A It's the "Guidelines for Validating Probabilistic  
3 Genotyping Systems" that was developed by SWGDAM.

4 Q Were you on SWGDAM when these were developed?

5 A Yes.

6 Q Were you involved in the subcommittee that developed them?

7 A I was not.

8 Q Did you vote on whether to adopt these guidelines?

9 A I did.

10 Q Did you vote in favor of them?

11 A I did.

12 MR. PRESANT: Your Honor, the government moves to  
13 admit 19.

14 THE COURT: Ms. Kloet.

15 MS. KLOET: No objection, Your Honor.

16 THE COURT: It's admitted.

17 BY MR. PRESANT:

18 Q Now, there's been some testimony, though we haven't pinned  
19 down an exact date of when these were adopted. Can you zoom in  
20 on the portion I just highlighted? Reviewing the part that  
21 I've just blown up, do you recognize a date that these were  
22 adopted?

23 A I do.

24 Q And when does it say they were approved for posting on the  
25 SWGDAM website?

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 A June 15th of 2015.

2 Q And so would you just summarize for the Court the  
3 significance of these guidelines as they relate to the use of  
4 probabilistic genotyping in the United States?

5 A Yes. So there was some discussion on the previous witness  
6 about what guidelines actually represent, and I would indicate  
7 the guidelines are basically recommendations. They are  
8 recommendations that if you for this particular guideline, if  
9 you want to validate a probabilistic genotyping software  
10 application, that you should follow these guidelines to  
11 properly validate the system. Dr. Buckleton had mentioned that  
12 there's a strong incentive to follow these guidelines as more  
13 of like standards, but there's not really a standard associated  
14 with these, it's just a strong recommendation that you follow  
15 these.

16 THE COURT: What is the incentive?

17 THE WITNESS: Just consensus in the community that  
18 these are -- there's not an incentive like you're going to get  
19 an audit finding when we undergo audits. There's not a  
20 monetary incentive. There's not an incentive to a particular  
21 government resources or anything like that. It's just a, it's  
22 driven in everyone that we do quality work. If you want to  
23 subscribe to doing that quality work, then it's highly  
24 recommended that you follow these guidelines.

25 THE COURT: And if you say that you follow them, does

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1 anybody determine whether you do follow them or have followed  
2 them?

3 THE WITNESS: So throughout accreditation, the  
4 accreditation process, there is a number of different standards  
5 that we follow. So when I mean standards, they are shalls.  
6 You shall do these things. So one organization that we are  
7 accredited to is an acronym called ANAB, it's the National  
8 Accrediting Board, and there's a host of standards associated  
9 with that particular organization and one is related to  
10 validation. There is another set of standards that SWGDAM also  
11 produces called the Quality Assurance Standards for Forensic  
12 DNA Testing Laboratories. So it's exactly how it's described,  
13 these are quality assurance standards. If you're a forensic  
14 DNA testing laboratory in the United States, you need to follow  
15 these. And that, there's a, there's an expectation that you  
16 follow those because it gives you access to other government  
17 resources such as data bases and other resources that the  
18 government maintains. So if you don't follow those standards,  
19 there's actually ramifications for it. And those standards  
20 also have directions specifically on how you conduct a  
21 validation.

22 In a very general sense, the validation needs to cover  
23 certain criteria. A little bit was discussed this morning  
24 about precision, and reliability; they have to cover the range  
25 of samples that you would normally cover in the laboratory

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1 during testing, you know, there's a whole host of standards.

2 And so your question is how does somebody check to  
3 make sure you follow those standards. We go through extensive  
4 audits every single year. For the ANAB standards, we are  
5 audited once every four years for what they call a full  
6 assessment. And that assessment for our system, for the  
7 Michigan State Police, can be as many as 75 independent  
8 assessors coming in from around the country and around the  
9 world and evaluating our practices and policies and procedures  
10 against these standards.

11 That occurs every four years. And then every year, so  
12 year 2, year 3, in between those there is also what they call  
13 surveillance visits where smaller contingency of assessors will  
14 come in to evaluate to make sure you're continuing your  
15 accreditation activities to make sure it's a part of your  
16 culture of your organization.

17 Aside from that accreditation process is also the  
18 quality assurance standards for forensic DNA testing and that's  
19 an every other year assessment.

20 So every other year we bring in, again, external  
21 assessors to evaluate specifically the DNA program to ensure  
22 that we are complying with the standards that are in place, and  
23 then on the opposite years, we are required to do our own  
24 internal review of our guidelines with those standards.

25 So continually there's some sort of an assessment

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1 going on with the laboratory.

2 THE COURT: Thank you.

3 BY MR. PRESANT:

4 Q With all those qualifications is it fair to say that to the  
5 extent that there is a document governing forensic DNA  
6 analysis, specifically probabilistic genotyping, and the  
7 validation of those systems in the United States, that this  
8 Exhibit 19 is that governing document?

9 A Yes.

10 Q Let's go back to Exhibit 2, please. Let's go to page 2. I  
11 have highlighted, Mr. Nye, just a portion of the trainings  
12 portion of your CV. Right?

13 A Correct.

14 Q And there are a couple on here that say STRmix training,  
15 right?

16 A Yes.

17 Q And so I want to ask you before you talk specifically about  
18 those, what training in general and these in particular you  
19 have had on STRmix.

20 A So before I get into STRmix, just probabilistic genotyping  
21 in general, there's what I would probably call less formal  
22 training that occurs. So when I go to a general conference  
23 related to forensic DNA testing, there is often presentations  
24 by experts in the field about probabilistic genotyping, you  
25 know, could have been somebody related to STRmix, or it could



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1 be related to a competitor to just kind of get a general  
2 understanding of the system. And then more formally, after we  
3 purchased STRmix it included formal training. Dr. Buckleton  
4 had mentioned it was four days. And, yes, it felt like more  
5 than a week. And that occurred in the spring of 2015 was our  
6 initial training event that included I think it was roughly, I  
7 forget if it was 10 or 20 people, it was in that class, and  
8 then we conducted a second class for an additional number of  
9 examiners in the summer of 2016.

10 Q Let's go to page 4. You have been published in several  
11 peer review journals on topics including DNA analysis, is that  
12 right?

13 A Yes.

14 Q Now, Mr. Nye, was there ever a time where you were cited  
15 for approving a report without proper technical review?

16 A Yes, there was.

17 Q Would you describe for the Court what happened in that  
18 instance and approximately when that occurred?

19 A I'm sorry, the last part.

20 Q When it occurred approximately.

21 A So we talked a little bit about accreditation, and one of  
22 the requirements as well as our own internal policies and  
23 procedures is that before a laboratory result is published that  
24 it undergo a review by a peer. They call them technical and  
25 administrative reviews. And approximately six years ago I

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1 inadvertently published three to four reports without the  
2 proper reviews being done. And this was the result -- I used  
3 the word inadvertently because it was a result of a software  
4 application that we use and under my specific profile with that  
5 software application, there were some additional privileges in  
6 that software application to issue reports that I didn't fully  
7 understand.

8 Q And you received some sort of citation for it?

9 A I did, yes.

10 Q Has the Michigan State Police promoted you since then?

11 A Yes. I have, so at that particular time I was the DNA  
12 technical leader and I have since been promoted to the  
13 assistant division director responsible for quality assurance.  
14 And then I've also received a number of different awards from  
15 the department as well.

16 Q Does that incident have any bearing on the adoption of  
17 STRmix by the Michigan State Police that you're here to testify  
18 about today?

19 A Not whatsoever.

20 MR. PRESANT: Your Honor, the government offers  
21 Mr. Nye as an expert in forensic science and DNA analysis.

22 THE COURT: Ms. Kloet.

23 MS. KLOET: Just a moment, Your Honor. No objection,  
24 Your Honor.

25 THE COURT: Thank you.

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 BY MR. PRESANT:

2 Q Mr. Nye, the Court had some questions this morning just  
3 about the overall process kind of soup to nuts from the time  
4 the sample comes into the laboratory until the time that the  
5 laboratory issues its reports about how forensic DNA analysis  
6 is conducted, specifically in a DNA mixture case like this one.  
7 I thought it would be helpful --

8 THE COURT: You're talking awfully fast.

9 MR. PRESANT: I appreciate you pointing that out. I  
10 often don't even notice, Your Honor.

11 It would be helpful I think if you started out by  
12 summarizing for the Court the process that the Michigan State  
13 Police use for that pipeline.

14 THE WITNESS: Yes.

15 THE COURT: Before you do that, and sort of in  
16 conjunction with that, could you pretend that I'm a jury of  
17 one, could you tell me, go through the process of DNA  
18 genotyping, if that's what it's called, before this  
19 probabilistic method was developed, and after it was developed.  
20 Can you lay those two things side by side so that I can  
21 understand the difference?

22 THE WITNESS: It's going to be a long explanation.

23 THE COURT: That's okay.

24 THE WITNESS: Please refrain me if I go into too much  
25 detail.

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1 THE COURT: Okay.

2 THE WITNESS: So previous to probabilistic genotyping  
3 and now in probabilistic genotyping, everything in the  
4 laboratory is the same. Everything is. So when I say  
5 everything, I'm talking about the DNA extraction method, the  
6 purification process, the DNA quantitation method to determine  
7 how much DNA we have, the DNA amplification, the actual  
8 separation and visualization of the different DNA fragments are  
9 all exactly the same.

10 The difference from let's say three years ago to today  
11 is just the tools that are used to assist the examiners in  
12 interpreting mixed DNA results. And I'm, I like Mr. Presant  
13 tend to speak relatively quickly and I'm choosing my words very  
14 carefully because I want to stress that the tools that are used  
15 may be different, but the approach and the modeling and the  
16 interpretation itself is very, very much the same.

17 I want to point out that STRmix is really just a tool  
18 applying methods and modeling that was previously used  
19 manually.

20 The significant difference with STRmix or any  
21 probabilistic genotyping system is that because it's computer  
22 based it allows the user to incorporate more data because the  
23 amount of data that was available exceeded what the average  
24 human could actually efficiently use and analyze.

25 THE COURT: So is it true that before the development

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1 of this probabilistic genotyping with software like STRmix, the  
2 determination of DNA matches and so forth was essentially  
3 manual, is that correct?

4 THE WITNESS: Yes.

5 THE COURT: There was no machine intervention that  
6 either produced results or interpreted results, is that fair?

7 THE WITNESS: There may be some tools just simply like  
8 Excel spreadsheets and some different things of that nature to  
9 just help with the math. The math is very simple to do. It's  
10 just more than what I would care to do and sit down and do it  
11 with a pen and a piece of paper and a calculator.

12 But the approach is very, very much the same.  
13 Dr. Buckleton had talked about certain artifacts. Stutter, we  
14 heard this morning about forward stutter and back stutter, and  
15 pull up, and all these different things. Those are still  
16 things that have always been there, and they have always been  
17 used in the interpretation, it's just now that there's actually  
18 a method that can, there is a tool that can be used to assist  
19 the DNA examiner to do it.

20 I might try and offer an example that might illustrate  
21 it a little bit better. So three years ago and prior for many  
22 years when you had a DNA mixture, the statistical approach that  
23 was very common in the United States was something called a  
24 CPI. Combined probability of inclusion. And the approach in  
25 that method is to only look at the DNA types that are present.

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1 So Dr. Buckleton had testified that there are DNA types. There  
2 is a DNA size, and then the height of the peak which  
3 corresponds to the relative amount of DNA that's in that  
4 mixture.

5 And so the CPI only looks at the presence or absence  
6 of a particular DNA type. It does not use the size of the  
7 fragment or the height or relative amount of each fragment.

8 THE COURT: So that the conclusion that would be  
9 reached pre three years ago would be the defendant's DNA was  
10 found on this gun, period. Or it was not found on this gun,  
11 period. Right?

12 THE WITNESS: It entirely depends on the data that's  
13 available and present to interpret. And I think that that was  
14 one thing I wanted to clear up from this morning.

15 I think there was some comment that we used 21 genetic  
16 markers. That number has varied over the years. The more data  
17 that you have, the more significant the statistic is.  
18 Regardless of which type of statistic you're generating,  
19 whether it's a likelihood ratio or whether it's a CPI or any  
20 other type of statistic, the more data that you can use, the  
21 more significant that interpretation, the statistical  
22 interpretation becomes.

23 And so your question is entirely based upon how much  
24 DNA data that you have to work with. So if you're targeting 21  
25 genetic markers, let's say, and you have a very limited amount

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1 of DNA that you're working with and you get data, useable  
2 interpretable data at let's say 3 or 4 genetic markers of the  
3 21 that you attempted, then your conclusion is going to be  
4 quite different in that and the significance of it. You may  
5 not be able to say his DNA is on the item or not on the item.  
6 It's more of the significance is going to be quite a bit  
7 different. Versus if you have a full range of genetic data at  
8 the 21 markers that you look at, then the significance of that  
9 statistic and the strength that you can apply to your  
10 statements related to that are quite a bit different.

11 So there's quite a bit of discussion around the 40 or  
12 50 million to 1 number that we have on this particular case. I  
13 have testified as low as 10 or 1 as far as a likelihood ratio.  
14 And that does not have the same significance. In your words, I  
15 would not be able to go in and say with any certainty that an  
16 individual's DNA was on a particular item with a likelihood  
17 ratio of that level.

18 Versus I have also testified to a likelihood ratio of  
19 a duodecillion to one ratio. My comments to the jury would be  
20 significantly different between those two situations. So here  
21 we have a likelihood ratio in the 40 to 50 million to 1, and I  
22 agree with Dr. Buckleton that's very strong evidence. And I  
23 also want to add because I think many of your questions this  
24 morning were how this is going to relate to the jury. And I  
25 know Mr. Presant's questioning, a lot of questioning will get

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1 into this later.

2 MR. PRESANT: We can do it now. That's fine with me.

3 THE WITNESS: So a likelihood ratio is just a  
4 different way to relate to the jury the strength of the  
5 evidence. And although Dr. Buckleton is an excellent  
6 instructor and an excellent researcher, myself as a  
7 practitioner I have to hone my craft, so to speak, about how I  
8 communicate to the jury. Because that's the end result of my  
9 work. I'm as much a communicator as I am a scientist. And we  
10 hire people and we work with them to develop how they interact  
11 and how they communicate to the jury. So a likelihood ratio is  
12 just a different way to relay that information to the jury and  
13 that is something that we develop over a period of time. So we  
14 are essentially two years into this process of moving from a  
15 frequency based statistic to a likelihood ratio based  
16 statistic, and we have been very cautious in how many of our  
17 scientists that we are training in this method so that we can  
18 sort of craft and mold how we present this information to the  
19 jury.

20 And your question about likelihood ratios, one way  
21 that you could present what a likelihood ratio is to a jury is  
22 to try and present it on a topic that they can actually grasp.  
23 DNA is hard for a lot of people, and so I like to bring in the  
24 idea of weather. Everybody pays attention to the weather.  
25 When I get up in the morning I look outside and it dictates



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1        what kind of day I'm going to have. And so one of the things  
2        that's actually in the training program that Dr. Buckleton runs  
3        through with new STRmix users is an example where if you look  
4        at the weather report and there was an 80 percent chance that  
5        it was going to rain today. The opposite of that is going to  
6        be there is 20 percent chance that it's not going to rain  
7        today. So that's basically your two competing hypotheses.  
8        Your prosecution hypothesis is going to rain, your defense  
9        hypothesis, it's not going to rain. So the ratio of 80 to 20  
10       is four. And the way that it would be worded, and hopefully in  
11       front of Dr. Buckleton I can somewhat closely get it right, is  
12       that given the evidence, it is four times more likely to rain  
13       than not rain. And that's a very easy understandable way for a  
14       jury to understand a likelihood ratio.

15                And when you apply that to forensic DNA, it becomes a  
16       bit more information to digest, but basically you give what  
17       your hypothesis is for the prosecution, which might be worded  
18       something like I have a mixture of three people, the  
19       prosecution hypothesis is Mr. Gissantaner, plus 2 unknown  
20       individuals, and then the defense hypothesis would be it's  
21       three unknown individuals, not Mr. Gissantaner. And it's the  
22       ratio between those two which turns out to be approximately 40  
23       or 50 million to 1 in favor of the prosecution.

24                So that's -- you kind of have to build up to it  
25       without just putting out a number and saying it's a likelihood

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1 ratio. You need to build into it a little bit.

2 THE COURT: Thank you.

3 BY MR. PRESANT:

4 Q We need to follow up on what you were just talking about.

5 How long has Michigan State Police been using  
6 likelihood ratios in one form or another in its testimony?

7 A So there are a number of different statistical methods to  
8 use and it really depends on which situation you're dealing  
9 with. And what I mean by situation, that means the type of  
10 evidence or the type of crime that you're working with. So if  
11 you have in its simplest terms a single source DNA profile, the  
12 very common method is the random match probability. That's a  
13 frequency. How often would you expect to see a DNA profile in  
14 a population. Then you get into a mixture where you have more  
15 than one person in a mixture. We currently use probabilistic  
16 genotyping, STRmix as that. And then another situation would  
17 be is if you're dealing with a criminal paternity case. So if  
18 there is a sexual assault that results in a child or a fetus,  
19 there's a criminal paternity case and that child or that fetus  
20 becomes the evidence which is essentially the joining of the  
21 victim and the potential assailant. And it's very common for  
22 probably I would say the last ten plus years that we use a  
23 likelihood ratio for criminal paternity cases, and then for --  
24 we don't do them -- but for noncriminal paternity cases, just  
25 parenthood, likelihood ratios are very common in the United

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1 States, in Michigan specifically.

2 Q Are there any other statistics that are frequently used in  
3 DNA cases besides likelihood ratio or the random match  
4 probability?

5 A CPI would be one. I referenced that previously.

6 Q That's the combined probability of inclusion?

7 A Yes. And then the antithesis of that it would be the  
8 combined probability of exclusion. Pretty much the same  
9 statistic. And then there are some laboratories in the United  
10 States that used likelihood ratios for even non paternity type  
11 of cases, and it's certainly much more prevalent in Europe and  
12 other areas of the world. It's just been delayed in getting  
13 into the United States.

14 Q Would you agree that one advantage of a likelihood ratio is  
15 that it incorporates uncertainty by using two competing  
16 hypotheses?

17 A It does.

18 Q All right. So you testified that everything really up to  
19 and including the generation of the electropherogram by the  
20 genetic analyzer is pretty much the same whether it's a  
21 probabilistic genotyping case or not, right?

22 A Correct, yes.

23 Q Does that process change at all whether the source of the  
24 genetic sample is from blood or from skin cells or from another  
25 type of cell?

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1 A The process?

2 Q Yeah, the extraction process, the whole laboratory process,  
3 does it change based on the source of the DNA?

4 A It does in one particular instance. If it's an item of  
5 evidence that results from a sexual assault, whether it's semen  
6 present, the extraction process is slightly different. But  
7 otherwise, everything is done the same.

8 Q Now two steps of the process are PCR, or, and then second,  
9 capillary electrophoresis, right?

10 A Yes.

11 Q PCR is the multiplication of the DNA that's present so it  
12 can be viewed, right?

13 A Yes.

14 Q And capillary electrophoresis is the sorting of the  
15 different fragments of DNA, right?

16 A It is.

17 Q Then those are imaged by the fluorescent tag we heard  
18 testimony about, right?

19 A That's correct. So during the amplification process each  
20 DNA fragment is tagged with a fluorescent label, and then as  
21 they are sorted in the capillary, they pass a detector, a  
22 camera, from which they could detect the fluorescence of each  
23 fragment as it goes by, then that detection is represented  
24 visually with an electropherogram or an e-gram as was described  
25 earlier today.

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1 Q Now, in the defendant's Daubert motion, he makes some  
2 passing arguments that there should be some question about the  
3 reliability of those two steps, PCR, and capillary  
4 electrophoresis because before those things existed DNA  
5 analysis could be done, right?

6 A It could be done, yes.

7 Q What's your view on how established PCR and capillary  
8 electrophoresis are both in forensic DNA analysis specifically,  
9 and all DNA lab work generally?

10 A So I have worked for the state police for 22 years and when  
11 I first came into the department PCR was not used. It was a  
12 different technology at that particular time called RFLP,  
13 restriction fragment length polymorphism.

14 P-O-L-Y-M-O-R-P-H-I-S-M. And it was approximately 1998 when we  
15 switched from the RFLP technology to a PCR based analysis  
16 method. So we are at this point in time 20 years into using  
17 PCR as a method. Really the only thing that's changed in  
18 20 years with respect to PCR is the number of genetic markers  
19 that we look at, and then there's been some increases in  
20 sensitivity of the systems that we use.

21 Approximately in 1998 when we first started using PCR  
22 we used a gel based system to separate out the DNA fragments,  
23 and then approximately in 2000 I believe it was we switched  
24 from a gel based system to a capillary electrophoresis. Which  
25 for all intents and purposes is the same as a gel based system

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1       only it's carried out in a small capillary. The system is  
2       really the same. And then it's been ever since 1998 to 2000  
3       it's been all capillary electrophoresis since then.

4               That's our system in forensic DNA analysis. The use  
5       of PCR and the use of capillary electrophoresis is throughout  
6       vast portions of research, medical applications, parentage,  
7       ancestry, a whole host of other applications all use the same  
8       technology that we are using today.

9       BY MR. PRESANT:

10      Q     And how does PCR compare to its predecessor, RFLP?

11      A     So RFLP technology I think at the time we were looking at  
12       five genetic markers. And those genetic markers had more  
13       statistical power per marker. They were more discriminating  
14       per genetic marker than what the STRs are. But it also  
15       required a very large sample size. There was some discussion  
16       about DNA quantitation this morning. And we can get DNA  
17       results from a very, very, very small sample in a nanogram or  
18       picogram range, but in RFLP technology we would require as much  
19       as 500 nanograms of DNA to get a result at that particular  
20       time.

21             So the sample size was orders of magnitude higher. We  
22       needed more in order to get a result. But then the other  
23       significant portion is that the RFLP technology required DNA  
24       that was in very good condition, had not been degraded,  
25       inhibitors, different things like that. It really required a

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1 very good sample. And the PCR technology with capillary  
2 electrophoresis allows us smaller sample sizes; it allows us to  
3 deal with samples that have been degraded or insulted in some  
4 way. And there is also sort of an efficiency standpoint, it's  
5 less hands on, it's more automated. Because of the increase in  
6 sensitivity there's more samples coming to the laboratory and  
7 we can get more work done when automation is going on.

8 BY MR. PRESANT:

9 Q Do I take from your answer then that capillary  
10 electrophoresis is also an improvement upon gel based  
11 separation of fragments?

12 A Significantly, yes.

13 THE COURT: Mr. Presant, I'm thinking about taking a  
14 break at about 2:30. Because I would like to go as long this  
15 afternoon as we can. So if you are getting ready to switch  
16 topics, or if you want to wrap up a particular topic, now is  
17 the time to think about it.

18 MR. PRESANT: I appreciate that, Your Honor. I'm  
19 happy to have the Court interrupt me whenever the Court is  
20 ready for a break.

21 THE COURT: Okay.

22 MR. PRESANT: Mr. Nye, so now I would like to ask you  
23 about the decision to begin to use probabilistic genotyping in  
24 general and to choose STRmix in particular because you were the  
25 person who made that decision, correct, for the Michigan State

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1 Police.

2 THE WITNESS: I was, yes.

3 BY MR. PRESANT:

4 Q And when you looked at where you were kind of in the  
5 progression of forensic DNA science over time and you look at  
6 the market of options of probabilistic genotyping software,  
7 what led you to make the consumer decision that you ended up  
8 making?

9 A Certainly. So my position as the DNA technical leader was  
10 to not only train individuals but seek out new technologies and  
11 make sure that we are current on everything we can be with  
12 what's available in the community, and certainly probabilistic  
13 genotyping offered an opportunity for us to improve our  
14 service. And specifically, the combined probability of  
15 inclusion statistic that was available was not, we did not use  
16 the entire set of data that was available to us, and it also  
17 resulted in a large number of analyses that would end in an  
18 inconclusive result because of that inability to use the full  
19 gamut of data that was available to us.

20 So there was an interest in furthering it because we  
21 knew, as did the community in general, that we weren't using  
22 the full amount of data that was available to us. So  
23 probabilistic genotyping would have been an advancement,  
24 another tool available to us to use our expertise in an area  
25 that we couldn't currently use it within. So then I started



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1 looking at the different opportunities, the different  
2 applications that were available, and there were two commercial  
3 ones. So basically the first decision that I looked at was do  
4 I use a commercial off the shelf product, or do I use what they  
5 would call a free ware system which is basically just a free  
6 system, and the question is how much support are you going to  
7 get. Are they going to continue to develop the product, make  
8 further advancements with the product, were they going to be  
9 able to help train, do all those different things. And when  
10 you're looking at a free software system, those resources are  
11 not available to you.

12 So if you make the first decision that you're going to  
13 look at a commercial off the shelf system that has those  
14 resources available, there is essentially two. One would be  
15 TrueAllele, which is an American company, and the second being  
16 the STRmix which is from New Zealand. So then you start and  
17 evaluate the application itself, what type of resources, where  
18 the rest of the community is going, the educational  
19 opportunities with understanding and learning because it's not  
20 enough to just have a piece of software where you can click a  
21 button and get an answer out the other side. You actually as a  
22 practitioner need to understand enough of the method to be able  
23 to convey that to the jury so that they can make the decisions  
24 that they need to make. And at the end of the day we felt  
25 strongly that STRmix was the system that we wanted and that's

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1 the process that we went.

2 Now, I want to back up for one second because I  
3 skipped over an important part.

4 So the Michigan State Police Forensic Science Division  
5 is made up of approximately 90 DNA examiners. It's a pretty  
6 good number. And with CPI or other more manual interpretations  
7 for mixtures, I believe Dr. Buckleton mentioned it, and I'm  
8 going to mention it again, is that when you put human  
9 intervention into something you're going to get some  
10 variability on how mixtures are interpreted. And going with an  
11 additional tool such as STRmix allowed us to standardize that  
12 approach a little bit. There is still some subjectivity, I  
13 think it's significantly less than prior to probabilistic  
14 genotyping, but from a management perspective it allowed us to  
15 standardize the approach and the level of service that we are  
16 providing to our customers, if that makes sense.

17 THE COURT: I think we are going to take our break  
18 here, Mr. Presant. We will come back in about 20 minutes.

19 MR. PRESANT: Thank you, Your Honor.

20 THE LAW CLERK: All rise. Court is in recess.

21 (Recess taken, 2:29 p.m.; Resume Proceedings,  
22 2:55 p.m.)

23 THE LAW CLERK: All rise. Court is back in session.  
24 Please be seated.

25 THE COURT: Mr. Presant.

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1 MR. PRESANT: Thank you, Your Honor. Mr. Nye, before  
2 the break you had testified about your lab's decision to use  
3 STRmix.

4 THE WITNESS: Yes.

5 BY MR. PRESANT:

6 Q And my question for you is when did the lab actually start  
7 using STRmix?

8 A In February of 2016.

9 Q And you testified earlier that only certain analysts were  
10 trained to use it?

11 A Correct.

12 Q What sort of training program did you develop for the  
13 people selected, the forensic scientists selected to use  
14 STRmix?

15 A So we required that they would have received the four-day  
16 training from Dr. Buckleton's group, as well as additional  
17 literature readings in our laboratory, and then a practice set  
18 of samples before we deemed them to have sufficient training.  
19 And then before they actually started using STRmix in case work  
20 there's a required competency test that I developed that they  
21 had to pass, and then once they started using STRmix in case  
22 work then they went through our normal proficiency testing  
23 program.

24 THE COURT: Can I ask one question here, Mr. Nye?  
25 When you say that a practice set of samples, does that mean a

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1 set of samples where the DNA contributor is known and they run  
2 it, run the sample to determine if they can agree with what you  
3 already know, is that it?

4 THE WITNESS: Yes, correct.

5 THE COURT: Okay.

6 BY MR. PRESANT:

7 Q So what's involved in the ongoing proficiency testing?

8 A So one of the accreditation standards is that everybody  
9 specifically in DNA do external proficiency tests twice per  
10 year. An external proficiency test is a mock case that's  
11 administered by a private company which I don't even know the  
12 answer to and each person has to complete that mock case  
13 proficiency test as though they would a regular case and then  
14 report the results to that external organization and they get a  
15 response back at some point in the future as to whether they  
16 successfully completed the proficiency test or not.

17 Q The Court has heard testimony today about the importance of  
18 internal validation before a forensic laboratory begins to use  
19 STRmix. In addition to training these analysts, did the  
20 Michigan State Police undertake an internal validation of  
21 STRmix?

22 A Yes, we did.

23 Q Prior to the internal validation of STRmix, in addition to  
24 the -- or strike that. Prior to the internal validation of  
25 STRmix, had you been involved with the internal validation of

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1 other forensic tools?

2 A Yes.

3 Q So you were familiar with the process for conducting  
4 internal validation?

5 A Yes, depending on what you're validating the process may be  
6 slightly different. But certainly, yes, that was a major  
7 portion of my responsibility as a DNA technical leader was to  
8 either complete it myself or to certainly oversee it.

9 Q And what's the theoretical purpose behind internal  
10 validation?

11 A So in my view there is really two different types of  
12 validation that occurs. There is a developmental validation  
13 which is typically done outside of the laboratory sometimes by  
14 the researcher, in this case ESR or other entities, commercial  
15 entities sometimes. That's a developmental validation and  
16 there is a requirement for an internal validation to make sure  
17 that the product or method works as expected in your hands, in  
18 your specific situation within your laboratory. And so we  
19 conducted an internal validation of STRmix.

20 Q Different laboratories have different conditions and  
21 instrumentation and procedures and so it's important to make  
22 sure the tool works in that particular environment.

23 A That's correct, yes.

24 Q Go to Exhibit 10, please. Do you recognize Exhibit 10?

25 A I do.

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1 Q What is it?

2 A It is a summary of our validation, our internal validation  
3 of STRmix in cooperation with our amplification chemistry which  
4 is PowerPlex Fusion that Dr. Buckleton had mentioned this  
5 morning.

6 Q Page 2, please. That's your signature at the bottom?

7 A It is.

8 Q It's dated February 22, 2016?

9 A It is.

10 MR. PRESANT: Government moves 10, Your Honor.

11 MS. KLOET: No objection.

12 THE COURT: It's entered.

13 BY MR. PRESANT:

14 Q So on this page 2 there's a paragraph here right underneath  
15 the table, is that right?

16 A Yes.

17 Q And what's that paragraph basically saying?

18 A So that paragraph is my declaration that the internal  
19 validation was completed and enclosed within the document that  
20 follows, meets as my determination as the DNA technical leader  
21 that meets the additional guidelines that were published by  
22 SWGDAM for validating Probabilistic Genotyping Systems.

23 Q Page 3, please. Now, you have some background information  
24 in this document, it's what, like a 40 or 50-page document,  
25 right?

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1 A It is.

2 Q So we don't need to go page by page, but I would like to  
3 direct your attention to page -- start with page 5. You  
4 discuss the concept of threshold here that's been talked about  
5 earlier, is that right?

6 A Yes.

7 Q And then on the next page stutter.

8 A Correct.

9 Q Page 11, please. There are drop-in parameters here, right?

10 A Yes.

11 Q And then you set the drop-in cap right here is 400, the  
12 Court has heard testimony about that earlier today too, right?

13 A That's correct, yes.

14 Q The drop-in frequency, there is also testimony about that  
15 figure, that was determined by this document during the  
16 internal validation?

17 A It was.

18 Q You discuss a concept called saturation here, is that  
19 right?

20 A Yes.

21 Q Let's go to page 20, please. What's being described here  
22 in this table 4, adjudicated cases?

23 A So the period of time that I was summarizing or completing  
24 the validation, the internal validation on STRmix within our  
25 system was around about the same time that the Daubert hearing

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1 was ongoing in Muskegon County. That was discussed earlier  
2 this morning. And although not required, there was some  
3 testimony from a defense expert in that particular hearing that  
4 it's very difficult to create samples in the laboratory much  
5 like you just explained a moment ago where we know the result  
6 because we created the samples, but that's not always the best  
7 reflection of a sample type that we would see from a crime  
8 scene. So in other words --

9 THE COURT: Is that correct?

10 THE WITNESS: I think it has some merit. The  
11 difficulty is that if you don't create the sample yourself, you  
12 really don't know what the ground truth of the sample is. So I  
13 think there is benefit from doing both. The samples that are  
14 created in the laboratory are typically coming from very nice  
15 samples, DNA that's extracted from blood, typically from some  
16 of your own employees, and we create mixtures of different  
17 proportions, different contributor numbers, we have a lot more  
18 control over that situation. But the advantage of looking at  
19 actual evidence from crime scenes is that they have gone  
20 through a bit more I'll use the word insults. Maybe they are  
21 dirty, they have been degraded, they are on different  
22 substrates. Maybe a cotton swab versus some blue jeans, versus  
23 a cigarette butt. I mean they represent a better range of  
24 things.

25 So we did both. Although not required. And this



## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 table in the exhibit shows a number of cases, and we used  
2 adjudicated cases with the understanding that to the best of  
3 our ability if the adjudication has been complete that that's  
4 the closest we can get to ground truth of whether somebody  
5 contributed to a sample or not. And we ran those adjudicated  
6 cases through STRmix and then compared the STRmix results to  
7 the adjudication and/or the statistical value that was provided  
8 previously to understand whether it's giving us -- it being  
9 STRmix -- is giving us information that is supportive of what  
10 was developed previously.

11 BY MR. PRESANT:

12 Q What was the conclusion from that analysis?

13 A So the overall conclusion is that if we were able to  
14 provide a statistical estimate with our standard, whether it be  
15 CPI or random match probability, STRmix was able to support  
16 that conclusion. Although it's a different type of statistical  
17 approach, it's a likelihood ratio as opposed to a frequency, it  
18 was still supportive of the end conclusion. The other thing  
19 that we could conclude out of it was that there was a  
20 significant number of samples or cases where we were unable to  
21 provide a result, a conclusion, because the statistics and the  
22 modeling, it was that manual approach, whereas if we ran it  
23 through STRmix we were able to provide some supportive  
24 information either through exclusions or inclusions. It would  
25 go both directions.

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 Q You tested firearms as part of this historical analysis?

2 A I believe so, yes.

3 Q So if we look at this one right here, the third entry of  
4 swabs from rifle, right?

5 A That's correct.

6 Q The original statistical value reported was 1.2 septillion?

7 A Correct.

8 Q And what was STRmix's conclusion upon reanalysis of that  
9 sample?

10 A So on that particular sample I just want to point out that  
11 was a two-person mixture and the 1.2 septillion represents AA  
12 frequency. So the proper way to word that particular type of  
13 statistic is that if you were to go out into the population at  
14 random, select people at random, you would expect to find a  
15 person that would match a particular donor within that sample 1  
16 out of every 1.2 septillion individuals. So very, very  
17 significant.

18 The STRmix results, which again is expressed as a  
19 likelihood ratio, gave a value of approximately 4.5 times 10 to  
20 the 24th times more likely that an individual is included in  
21 that mixture than not included. So both very strong  
22 indications of inclusion, just two different ways to represent  
23 the results.

24 Q Page 22, please. Zoom in right here. So this is another  
25 example of a firearm right here, a shotgun trigger, right?

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 A Yes.

2 Q Would you describe the results of the analysis of this  
3 case?

4 A So this case is a partial mixture, so what that means is  
5 that we have DNA from more than one person but we don't have a  
6 full complement of all the data for all the genetic markers.  
7 We estimated that to be a two-person mixture, and our initial  
8 conclusion was that there is nothing applicable, it was  
9 inconclusive. And our result with STRmix was a likelihood  
10 ratio that was less than 1, which would support the defense  
11 hypothesis that somebody was not included within that.

12 Q Page 4, please. These were a number of other firearms you  
13 tested it on right here, right?

14 A Yes, that's correct.

15 Q Page 25. More firearms, all those revolvers right there,  
16 correct?

17 A Correct.

18 Q Let's jump ahead to page 29 now. Let's zoom in on the  
19 chart on just the first few lines of the text below. Mr. Nye,  
20 would you discuss for the Court what was being analyzed in this  
21 portion of the validation study?

22 A Certainly. So this is a lab created mixture, two  
23 individuals in a 1 to 1 ratio. So equal proportions of each  
24 contributor to the mixture. And then depending on the  
25 hypotheses that would be set up within the STRmix software, we

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 would result in different likelihood ratios. So the  
2 significance of the comparison would be predicated upon the  
3 hypotheses that you would use. So as an example, in that first  
4 block under number 15, sample 15, if we had a set of hypotheses  
5 where the prosecution hypothesis was that it was a two-person  
6 mixture, that included item number 15 or person number 15, and  
7 some unknown contributor, and then the defense hypothesis would  
8 be that it would be two unknown contributors, our likelihood  
9 ratios would be essentially ten to the 20th on an order of  
10 magnitude. So significant.

11 If we took that exact same mixture and looked at the  
12 other contributor, so our hypotheses would be it's item or  
13 person number 17 and an unknown contributor, versus two unknown  
14 contributors, our likelihood ratio would again be in the ten to  
15 the 20th area.

16 If we change our hypothesis on the prosecution  
17 hypothesis, we are going to say that that two-person mixture is  
18 made up of individual number 15 and individual number 17, but  
19 the defense hypothesis is that it's two unknown individuals,  
20 you can see that the significance of the statistic jumps to ten  
21 to the 50th power.

22 So the point in this is is that depending on the  
23 hypothesis that you use or the hypotheses that you use, it can  
24 change the significance of the statistic significantly.

25 And this might be a good point to explain how we come

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 up with our hypotheses that we use in our report, our  
2 analytical reports that we issue.

3 So based on information that we are provided when the  
4 case is submitted to us from law enforcement, we will use our  
5 best judgment as to the hypothesis that we will use in our  
6 analytical report. But we also have a statement in every  
7 single report that upon request we will rerun the analysis with  
8 another set of hypotheses.

9 So let's say there's a couple scenarios. Let's say an  
10 individual is sexually assaulted and we find out that on a  
11 particular orifice swab there's three, it appears that there's  
12 three donors to the swab. We could run that as the victim, the  
13 female victim being a contributor in that sample and two  
14 unknowns, I'm sorry, with the suspect and an unknown, versus  
15 the victim and two unknowns, and then later on if we come to  
16 find out that there was a consenting partner that she had sex  
17 with around the time of the assault, we can change our  
18 hypothesis to say that it was the victim, the suspect, and this  
19 elimination individual versus the victim, the elimination, and  
20 some unknown person. So we can change the hypotheses as we go,  
21 and it has a bearing on the statistics that's provided. And of  
22 course we open up that opportunity to defense counsel as well;  
23 if they want to propose other alternatives, we will certainly  
24 run the software with their alternative and issue a report then  
25 we can talk about the merits of their hypothesis when trial

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 comes.

2 Q But you can at least do whatever calculation they wanted to  
3 do then the parties could debate which set of hypotheses were  
4 more reasonable.

5 A That's correct, yes.

6 Q All right. So after this two-person mixture analysis was  
7 done, in this text below you start talking about another  
8 analysis, a three-person mixture analysis, right?

9 A Correct.

10 Q It says here you did it using what ratio of contributors?

11 A So a 10 to 5 to 1. So you have a major donor, an  
12 intermediate donor, then a minor donor. So basically trying to  
13 run the range of what we would see. Rather than like the one  
14 above which was equal contributions of the DNA to the mixture,  
15 we look at a three-person mixture with different contributions  
16 from each person.

17 Q So the minor contributor here, the 1 would represent  
18 roughly just under 7 percent of the sample right, 116th, did I  
19 do that math right?

20 A Correct, yes.

21 Q So can we go to the next page, please? And let's start  
22 with just the chart. This is the result of that three-person  
23 analysis, is that right?

24 A Correct. So the layout is similar. Different hypotheses  
25 along the bottom. And then the likelihood ratio or the log

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 likelihood ratio represented there, so they range anywhere from  
2 10 to the 10th power, to as much as high as 10 to the 60th  
3 power, depending on the hypothesis that you set up.

4 Q And because those numbers are also large your conclusion  
5 was that?

6 A It was significant support for inclusion.

7 Q That STRmix could work on a three-person mixture with these  
8 ratios, minor contributor down to just below 7 percent.

9 A Yes.

10 Q Let's zoom out and go to the text right here. You next did  
11 validation on a four-person mixture, correct?

12 A Correct.

13 Q What were the ratios there?

14 A A 10 to 5 to 1 to 1, so that would be a major donor,  
15 intermediate donor, and two minor donors.

16 Q The minor donor in that case would be roughly 1 --

17 A 17th.

18 Q 17th, so a little bit smaller than before the minor donor?

19 A Correct.

20 Q And if we go to the next page. You see the chart. What  
21 were your conclusions about this chart?

22 A That it still models the four-person mixtures in those  
23 ratios very well. You can see that as you become a minor donor  
24 in a four-person mixture, that because the software  
25 incorporates more combinations in different possibilities that

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 it has an effect on the likelihood ratio. So as there is more  
2 combinations and more possibilities that it considers, the  
3 likelihood ratio becomes smaller, which is understandable.

4 Q Mr. Nye, are there any other portions of this validation  
5 study you would like to touch on?

6 A There was some discussion previously about repeatability,  
7 or the variation between one run and another run. And I did a  
8 study related to that. I forget right now the exact results of  
9 that study but I think Dr. Buckleton had mentioned that it  
10 could be circle around a ten full plus or minus. I wouldn't  
11 disagree with that. There is some variation. That's not  
12 unexpected. The similar variation that we would see with other  
13 statistical methods as well. The random match probability  
14 which has been used since, gosh, the early to mid 1990s is not  
15 uncommon to explain to a jury that the true value is ten fold  
16 higher or ten fold lower from the number that you are  
17 presenting. It's an estimate for a reason.

18 I also looked at partial data, so if you took a single  
19 source DNA profile and just continually removed data, so  
20 basically mimicking drop-out, that it has an impact on the  
21 likelihood ratio. So the less data that you put into the  
22 system, the lower your likelihood ratio can be.

23 So that would mimic something similar to the sample on  
24 this case where we have some drop-out or loss of DNA types that  
25 could be contributed to the defendant. That that actually



## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 impacts the likelihood ratio to a less significant statistic.

2 I'm sure there was more. But those are the couple  
3 that come to mind.

4 Q Just one more I would like to touch on. Can we go to page  
5 36, please? Zoom in right here. In addition to the charts we  
6 reviewed earlier about the various person mixtures and other  
7 ratios, you also tested other combinations of two, three and  
8 four-person mixtures?

9 A Yes.

10 Q And the ratios are contained in this paragraph here?

11 A Yes.

12 Q So one of them is 10 to 10 to 5 to 1?

13 A Correct.

14 Q So that would mean the minor contributor would be less than  
15 four percent?

16 A Correct.

17 Q One in 26. What's your, what was your conclusion about the  
18 efficacy of STRmix on those types of mixtures?

19 A So it still works very well. As Dr. Buckleton and I agree,  
20 four-person and five-person mixtures it works very well. It's  
21 just you get to the point of the computing power and how long  
22 each run is. We set a policy that we will not go over  
23 four-person contributors. I do know other laboratories in the  
24 U.S. that will go to five, but I would agree that most are in  
25 that four to five-person range. We did not test five. But it

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 works very, very well at four. And the more minor, the minor  
2 component is, so in that four percent range, because it has  
3 more possible combinations that it's looking at, the likelihood  
4 ratio is lower. And that's okay. That's a fair representation  
5 of that particular sample.

6 Q Turning to another topic. Is your laboratory accredited  
7 and audited?

8 A It is.

9 Q And does the use of these Probabilistic Genotyping Systems,  
10 STRmix in particular, comply with your accreditation standards?

11 A It does. We have not had any findings in that particular  
12 arena.

13 Q Are you aware of state commissions on forensic science that  
14 have reviewed probabilistic genotyping in general?

15 A Yes.

16 Q And have some of them approved of the use of probabilistic  
17 genotyping?

18 A They have, yes.

19 Q Let's go to Government's Exhibit 11. 11 isn't found in the  
20 book, Your Honor, because it's some 4, 500 pages long. We  
21 provided a copy to the Court but we just printed it once. Do  
22 you recognize 11, Mr. Nye?

23 A I do.

24 Q What is 11?

25 A Our procedure and training manuals for the DNA program.

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 Q And what sorts of things does this manual cover?

2 A So it's divided up into two major categories, a training  
3 manual, which has some relevancy to this proceeding but it  
4 also, the other section is our procedure manual, basically our  
5 instructions to our examiners on how they analyze evidence, how  
6 they interpret it, how they report it, makeup of chemicals and  
7 QC and different things of that nature.

8 Q Does it cover topics like handling of evidence in a  
9 laboratory?

10 A It does.

11 Q Are there strict procedures in place to try to minimize the  
12 likelihood of cross contamination?

13 A There are.

14 Q Does it cover decisions that a particular forensic  
15 scientist has to make when analyzing an electropherogram?

16 A It does.

17 Q And does it provide guidelines for using STRmix in the  
18 Michigan State Police setting?

19 A Yes, it does.

20 MR. PRESANT: Your Honor, the government moves to  
21 admit 11.

22 THE COURT: Ms. Kloet.

23 MS. KLOET: I have no objection. This is the full  
24 policy manual? I just don't have a copy in my binder. Is this  
25 the whole manual?

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 MR. PRESANT: It's, can we go to the last page? I  
2 don't know how many pages there are. That would probably be  
3 the best way to get an idea of the scope.

4 THE COURT: 446.

5 MS. KLOET: If that reflects the whole manual, I'm  
6 fine with it.

7 MR. PRESANT: I believe it does.

8 MS. KLOET: Okay.

9 THE COURT: Do you have any objection?

10 MS. KLOET: No objection, sorry, Your Honor.

11 THE COURT: It's admitted.

12 BY MR. PRESANT:

13 Q Now, while we are on the topic of possibility of  
14 contamination, is that something you worry about as a  
15 supervisor of DNA analysis at the Michigan State Police lab?

16 A Yes.

17 Q Why do you worry about it?

18 A So when I described previously the changes in technology  
19 over the 22 years that I've been in the system, the sensitivity  
20 of what we do has increased dramatically. And when I'm  
21 referencing sensitivity, what I'm referencing is the ability to  
22 detect DNA at smaller and smaller and smaller quantities. And  
23 so one thing that you have to be concerned about is that when  
24 your sensitivity increases in your laboratory analysis, that  
25 you're actually detecting DNA that's from the crime scene and

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 not cross contaminating with other items or contaminating with  
2 DNA from yourself or other exogenous items. So it's something  
3 that we work very closely with. There are accreditation  
4 standards that speak to some of these items such as training  
5 and policies and procedures, and facilities, evidence handling,  
6 there's a number of accreditation standards that speak to this,  
7 and then also we have our own requirements to try and minimize  
8 it.

9 Q Are you confident in the procedures that have been put in  
10 place in order to handle DNA evidence at the MSP lab?

11 A I am.

12 Q Now, a closely related topic is this idea of touch or  
13 transfer DNA. Are you familiar with that concept?

14 A I am. Depending on the terminology that you use, it may  
15 mean very different things. But we will see.

16 Q What do those mean to you if I say touch DNA or transfer  
17 DNA?

18 A So in my world when I talk about touch DNA, I'm talking  
19 about DNA that can be recovered from an item that was handled  
20 for a short period of time. So we could be talking about a  
21 doorknob, a pen, I mean a whole host of different things. That  
22 continuum of what people want to consider touch DNA can range  
23 quite a bit further than that. Some people may consider touch  
24 DNA a garment that you're wearing. Or more intimately held  
25 items than something that's just touched for a brief period of

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 time. So there is not a lot of consensus on what you consider  
2 to be touch DNA, so we have to be somewhat cautious of what we  
3 lump into that type of explanation.

4 Q What about the idea of DNA transfer and the related ideas  
5 of primary transfer, secondary transfer, are you familiar with  
6 that terminology?

7 A I am.

8 Q What does it mean to you?

9 A Well, when you get into primary and secondary transfer,  
10 again, there is some differences of opinion as to what that  
11 actually means. But in a very general sense when we talk about  
12 transfer of DNA, just me picking up this cup could be I'm  
13 transferring my DNA to the cup. Now, when you start to get  
14 into secondary transfer and tertiary transfer, if you pick this  
15 cup up after I have handled it and then go to the door, are you  
16 going to transfer my DNA from this cup to another item. And  
17 that's a more extended version of transfer that can be  
18 discussed.

19 Q Are you aware of literature where people have attempted to  
20 study those types of DNA transfer?

21 A You chose your words very well. Attempted because it's  
22 very, very difficult to model that type of situation. And  
23 there have been studies, and they have come up with a variety  
24 of different conclusions as to how prevalent or how rare that  
25 type of situation is.

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 Q Can we bring up Exhibit 9, please? And go to page, well,  
2 first on page 1, you recognize this as a laboratory report or  
3 the format of a laboratory report produced by Michigan State  
4 Police?

5 A Format, yes.

6 Q You didn't produce this report?

7 A I did not.

8 Q Can we go to the second page, please? Can we zoom in on  
9 that table? There's been testimony today, Mr. Nye, about how  
10 we communicate likelihood ratios to a jury. What is the  
11 significance of the table that I'm showing you here?

12 A So when we produce a likelihood ratio statistic, it's a  
13 numerical form. In this particular case, 40 or 50 million to  
14 1. And I had previously explained that we have approximately  
15 90 DNA scientists just within our one organization, let alone  
16 any other experts that might review that material or testify to  
17 those findings, and for me 40 or 50 million to 1 may mean  
18 something quite different to somebody else.

19 And so we created a policy of a verbal equivalent of a  
20 numerical value. So in other words, to try and standardize or  
21 bring some normalization to how we testify with the Michigan  
22 State Police. So if you get a value that's let's say a  
23 likelihood ratio of greater than 0 to 99, I think I've  
24 mentioned I have testified before to a value that was 10. What  
25 does that 10 actually mean? A 10 to 1, 10 times more likely

## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 than not, to me represents something that's relatively  
2 uninformative. You're very close to 1 which I think  
3 Dr. Buckleton had mentioned is uninformative, to me that has  
4 less value than a likelihood ratio that's a duodecillion to 1.  
5 And so this is our effort to try and bring a verbal equivalent  
6 to a numerical value to again assist the jury and assist our  
7 scientists to normalize how they respond to how strong or weak  
8 the evidence is.

9 THE COURT: Isn't that to some extent invading the  
10 province of the jury?

11 THE WITNESS: I think what it's doing is, DNA is very  
12 good at, DNA analysis is very good at determining whether,  
13 whether you have a result that can support an inclusion or  
14 exclusion. I think the significant portion of that is is that  
15 DNA testing can't fully explain how the DNA was deposited on  
16 that item or how it came to be found there. I think that was  
17 what Dr. Buckleton was trying to explain is that when you have  
18 a likelihood ratio, it helps inform a part of it but there's  
19 other items and investigative information that fully informs  
20 the jury as to the significance of that.

21 So our effort here is not to provide any more  
22 information to the jury other than to normalize how we present  
23 the data and the significance that we see in it so that we  
24 don't have wide variations of what a million to one means  
25 versus me versus somebody else.



## JEFFREY NYE - DIRECT EXAMINATION - MR. PRESANT

1 BY MR. PRESANT:

2 Q So you helped develop this verbal equivalency table?

3 A I did.

4 Q And the top level is 10,000 or greater, correct?

5 A It is.

6 Q So that would be three orders of magnitude or a thousand  
7 times lower than the tens of millions of range that we have had  
8 testimony about here today like 50 million, right?

9 A That's correct, yes.

10 Q The purpose of this equivalency table is to impose  
11 uniformity, correct?

12 A It is.

13 Q That's part of the purpose of the policy and procedures  
14 manual that we just looked at, Exhibit 11?

15 A It is.

16 Q That's part of the reason that you testified you chose to  
17 adopt PG system such as STRmix in the first place to impose  
18 uniformity on the way that DNA mixture analysis is done,  
19 correct?

20 A Certainly one portion of it, yes.

21 Q And are you aware of the labs in the United States, the  
22 forensic laboratories in the United States that are doing  
23 probabilistic genotyping analysis, what percentage of them are  
24 using STRmix as opposed to some other form of software?

25 A I don't have access to the same level of information that

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 Dr. Buckleton does. But when I go to different conferences, go  
2 to SWGDAM, also a member of the OSAC through NIST, and have  
3 just individual conversations with different laboratories or  
4 representatives from those laboratories, there is a significant  
5 portion of people that either have purchased it and implemented  
6 it, or have purchased it and are going through the validation  
7 process right now. The validation process is extensive. We  
8 talked about the end date of February of 2016. But it was  
9 actually started, the validation formally was started in about  
10 July or August of '15. So it takes quite a period of time.  
11 And certainly a year from now there will be significantly more  
12 laboratories that will have implemented it because they are  
13 undergoing their internal validation right now.

14 MR. PRESANT: Thank you very much. Nothing further,  
15 Your Honor.

16 THE COURT: Cross-examination.

17 MS. KLOET: Thank you, Your Honor.

## CROSS-EXAMINATION

18  
19 BY MS. KLOET:

20 Q Good afternoon.

21 A Good afternoon.

22 Q Just to refresh my recollection, when did the MSP or when  
23 did you decide to purchase STRmix on behalf of MSP?

24 A I don't know if I can clarify exactly when I decided to  
25 purchase it. But I can say that in I think it was May of 2015

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 I think it was was when we had our first training event. So  
2 the purchase would have been shortly before that time period.

3 Q Okay. Thank you. During the decision making process I  
4 believe you testified that you read developmental studies with  
5 respect to STRmix, developmental validation studies?

6 A I read a number of different literature, citations, spoke  
7 with a number of different individuals, received demonstrations  
8 of the software application as it existed at that particular  
9 time. I did quite a bit of I guess I'll use the word research  
10 before I ultimately made my decision.

11 Q Of the studies that you read specifically, can you recall  
12 how many of them involved complex mixtures of three or more  
13 contributors?

14 A I think many of them do. That's where STRmix or other  
15 probabilistic genotyping applications excel. And so I'm sure a  
16 large portion of them had mixtures that were more than two  
17 individuals.

18 Q You said many. Do you have any idea how many?

19 A I don't recall. It's not something I tracked.

20 Q Okay. I believe you testified the date that STRmix went  
21 live was approximately February of 2016.

22 A Correct.

23 Q Okay. The time that you purchased STRmix in or before May  
24 of 2015, were you aware of any errors in the program?

25 A Not that I specifically recall. I mean at that particular

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 point in time -- so let me back up just a second. So when we  
2 implemented in February of 2016, I believe we were laboratory  
3 number 9 in the country to actually implement. I may be wrong  
4 on that. We were a very early adopter. So if you back up a  
5 year from the time that we implemented to the approximate time  
6 of when we purchased, there wasn't as much information out  
7 there about like coding errors and things of that nature. I  
8 think Dr. Buckleton had mentioned about his personal website  
9 and different websites that they are posting a lot of that  
10 information, and a lot of those weren't available. I don't  
11 recall if I ever had a discussion with the distributors of the  
12 application about whether there was coding errors. I don't  
13 recall whether I did that or not.

14 Q Okay. And you just referenced Dr. Buckleton's publishing  
15 of a few errors. And I believe that one of those was admitted  
16 as an exhibit or document representing those through the  
17 government's direct exam of John Buckleton.

18 A I believe so, yes.

19 Q Were you aware of those specific errors?

20 A I was aware of the specific error as it relates to the one  
21 of our version.

22 Q So is it your testimony today there was only one potential  
23 error in your version?

24 A I think that was Dr. Buckleton's testimony.

25 Q Okay. I'm going to help refresh your recollection if we

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 pulled up that document.

2 A Sure.

3 MS. KLOET: Your Honor, can I ask the Court to pull up  
4 Government's Exhibit 14?

5 THE COURT: I think we are going to ask the  
6 government's tech to do it.

7 MS. KLOET: Thank you.

8 BY MS. KLOET:

9 Q So this is the document that was previously admitted with  
10 respect to the errors in STRmix. I would like you to look at  
11 these paragraph 3. This paragraph indicates that there was an  
12 issue with the version that MSP employed, correct?

13 A Yes, if it's version series 2.3 and we use 2.3.07.

14 Q And were you aware of that particular issue at the time  
15 that you purchased STRmix?

16 A I'm not sure that they were aware of it at that particular  
17 time. I was not aware or if I was aware, because it's such a  
18 rare instance on a specific scenario, I'm not sure it would  
19 have necessarily impacted my decision to purchase or not  
20 purchase it. I don't recall specifically.

21 Q So you don't remember if you were aware of this particular  
22 error.

23 A I do not.

24 Q Okay. Thank you. Did you become aware of those errors  
25 after the purchase of the program?

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 A I don't remember if I was aware of it before it so I don't  
2 know if it was after or not, I'm sorry.

3 Q Did you first become aware of it today?

4 A No. No. If that's your question, no, I knew of it before  
5 then.

6 Q That is my question. Thank you. I would like to talk a  
7 little bit about the training at MSP with respect to STRmix.  
8 You came up with the competency test for the analysts with  
9 respect to STRmix, correct?

10 A Yes.

11 Q And you administered that test to the 90 or so, I guess the  
12 portion of the 90 or so analysts that are --

13 A Correct.

14 Q Okay. Thank you. Now, at the time you did this, had you  
15 passed any competency tests yourself before administering it?

16 A No. It's sort of a chicken and egg kind of thing. You  
17 can't competency test yourself if you're the one that's  
18 administering the competency test. So as a DNA technical  
19 leader there is no requirement that I become competency tested  
20 before I administer the competency test to others. The real  
21 test, so to speak, is I make a mixture up that represents the  
22 range of testing that we do and I know the answer to it because  
23 I made it up myself. That's the real essence of the test.

24 Q Okay. Had you taken and passed any competency test on  
25 STRmix?

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 A No.

2 Q Thank you. I would like to talk a little bit about the  
3 internal validation MSP completed in this case. You referenced  
4 adjudicated cases earlier.

5 A Correct.

6 Q And I believe you suggested that you utilized those because  
7 they tended to be more representative of real life samples?

8 A They can be.

9 Q And why is that?

10 A For the reasons I explained previously which was that they  
11 are more representative or they can be more representative of  
12 evidence types that we get in the laboratory; so they have been  
13 subjected to different conditions, there's varying amounts of  
14 DNA, varying numbers of contributors, on different substrates.  
15 And what I mean by substrates is the surface that they are on,  
16 whether it be a fabric of a particular kind or whether it's on  
17 a hard surface like a gun, or just a whole host of different  
18 conditions that are sometimes a little bit hard to mimic in the  
19 laboratory.

20 Q Thank you. And you are comparing your results in STRmix to  
21 the adjudicated conclusion, correct?

22 A Correct. It's the only other source of information that we  
23 have because we, we didn't deposit the DNA on the item so we  
24 don't actually know whose on the item or in what proportions  
25 that they are on the item. So that's the closest we can get to

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 a comparison. So my position was it's better to do that  
2 comparison knowing that there is some shortcomings of that  
3 comparison than to not do the comparison at all. That there  
4 was some value in doing that.

5 Q So you're comparing it to your conclusion not to ground  
6 truth, so to speak, in those cases?

7 A Right.

8 Q Thank you. And I believe you testified that STRmix is  
9 validated for up to four potential contributors?

10 A Yes.

11 Q So four contributors for purposes of this version of STRmix  
12 at MSP is the boundary of acceptable use.

13 A That is the boundary that I placed on it, yes.

14 Q Okay. But isn't it true that the true number of  
15 contributors is always unknown?

16 A It is always unknown, and I would agree with Dr. Buckleton  
17 that you can estimate it. It's better to be conservative than,  
18 or correct than to be incorrect. But I would also clarify that  
19 that estimation, I don't know if I'm going to use this term  
20 correctly, but it's an informed estimation. The estimation of  
21 the number of contributors is not a trivial matter. We spend a  
22 fair amount of time in our policies and procedures explaining  
23 what things to consider when trying to make an estimation as to  
24 the number of contributors. And we train quite a bit around  
25 that. And it comes through training and experience and



## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 knowledge and procedures.

2 Q Did you publish the MSP validation summary, internal  
3 validation or study in any peer reviewed journals?

4 A No. Our positions as forensic scientists, as practical  
5 practitioners isn't really to go out and publish material.

6 Q Did you -- did any third party duplicate any of the tests  
7 that you performed during the validation?

8 A No.

9 Q Would you mind pulling up your Exhibit 9?

10 MR. PRESANT: Exhibit 9 wasn't admitted.

11 MS. KLOET: It wasn't admitted?

12 BY MS. KLOET:

13 Q What is this document? I know you already looked at it but  
14 just for clarification.

15 A It would be a laboratory report reference a specific  
16 laboratory number and date and time for an agency.

17 Q And you previously looked at the second page of this  
18 document, right?

19 A I believe so, yes.

20 Q And we were talking or you were testifying about the chart  
21 that's on this second page. You are the individual who created  
22 these guidelines, right?

23 A Yes.

24 Q Okay. You determine these cutoff values?

25 A So the cutoff values for the verbal equivalent were derived

## JEFFREY NYE - CROSS EXAMINATION - MS. KLOET

1 from a publication which I don't have with me today but I could  
2 certainly provide it to the Court if necessary. It was a  
3 journal publication, peer reviewed journal publication not  
4 related to DNA but it was related to other forensic evidence.  
5 I believe it might have been maybe latent prints, and where  
6 they do likelihood ratios and have a verbal equivalent for a  
7 likelihood ratio. I used that as a guide. This is not  
8 verbatim out of that publication. There were too many  
9 different statements, there is too many different categories.  
10 I believe that the publication might have had maybe eight or  
11 nine different categories. It's like the equivalent of saying  
12 very, very, very strong evidence. It just how many times can  
13 you say the word very. So I condensed a number of them and  
14 then I don't recall if I specifically adjusted the range or the  
15 numbers, but that was where it was derived from.

16 And then I will also offer that in the forensic  
17 community for those that have adopted probabilistic genotyping,  
18 the use of a qualitative equivalent, some laboratories use  
19 them, and some not. And those that do use them they generally  
20 are consistent amongst them. But it's something that is being  
21 looked at in the community to see if we can standardize those  
22 verbal equivalents. So my effort to standardize within our  
23 laboratory, there is an interest to standardize that across the  
24 forensic DNA community as well.

25 Q So you made your own personal judgment call with respect to

1 the creation of this qualitative equivalent chart, fair to say?

2 A Yes.

3 Q You did that based on a study that had nothing to do with  
4 DNA.

5 A Forensic latent print examination.

6 Q Not DNA, fair to say?

7 A Correct.

8 Q And that was published in a peer review publication.

9 A I believe so, yes.

10 Q But you changed what was published in the peer review  
11 publication for MSP's purposes, true?

12 A I certainly condensed the number of categories because I  
13 thought it was overly confusing to have that many different  
14 categories. And I don't recall whether I changed the  
15 likelihood ratio cutoffs for the verbal equivalent.

16 Q Okay.

17 MS. KLOET: Thank you. I don't have anything further.

18 THE COURT: Thank you. Any redirect, Mr. Presant?

19 MR. PRESANT: No, Your Honor.

20 THE COURT: Thank you. You may step down, Mr. Nye.  
21 Thank you for your testimony. Your next witness is going to  
22 take how long?

23 MR. PRESANT: I would have given a different answer  
24 this morning but at the pace we are going I would say could be  
25 an hour to an hour and a half.

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 THE COURT: Well, let's do this. Let's get started  
2 and see how far you get by 4:15.

3 MR. PRESANT: That sounds good to me. Your Honor, may  
4 I raise just one legal issue now or be better to wait until the  
5 end of the day?

6 THE COURT: Depends on what the issue is.

7 MR. PRESANT: Your Honor just made some comments at  
8 the conclusion of Dr. Buckleton's testimony with respect to the  
9 Court's role in Daubert, and I'm making sure that, and I may  
10 have misinterpreted the Court's comments, that the evidence was  
11 handled properly. And I didn't know if we were just talking  
12 about in the lab or chain of custody issues as well. The  
13 government hasn't prepared witnesses for this hearing that  
14 would address chain of custody, and if the Court needs to hear  
15 from them I'll understand that. But it's been treated on page  
16 19 and 20 in our brief and response. The government's view  
17 chain of custody is really an issue for trial about whether the  
18 officers did it properly. So we prepared our proofs today with  
19 respect to the reliability of the technology.

20 THE COURT: I don't believe the chain of custody or  
21 how it was handled has anything to do with what we are about in  
22 this hearing. So, no, my answer is no. There is no need for  
23 the government to put on any testimony as to that.

24 MR. PRESANT: Thank you, Your Honor. I just wanted to  
25 clarify. With that clarification the government calls

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1 Ms. Amber Smith.

2 THE COURT: Okay. My purpose in exploring that with  
3 Dr. Buckleton was simply to delineate the different areas that  
4 are pertinent to the development of this kind of test, of this  
5 kind of result, not that we're about examining it here.

6 MR. PRESANT: That was very well my misunderstanding,  
7 Your Honor. I appreciate the clarification.

8 AMBER SMITH, GOVERNMENT WITNESS, WAS DULY SWORN

9 THE LAW CLERK: Please be seated. And state your full  
10 name for the record, spell your last name.

11 THE WITNESS: It's amber, A-M-B-E-R, Smith, S-M-I-T-H.

12 DIRECT EXAMINATION

13 BY MR. PRESANT:

14 Q Ms. Smith, where do you work?

15 A I am a forensic scientist with the Michigan State Police in  
16 the Lansing laboratory in the Biology DNA Unit.

17 Q Can you bring up 3, please? Do you recognize Government's  
18 Exhibit 3?

19 A I do.

20 Q What is it?

21 A This is a copy of my curriculum vitae.

22 MR. PRESANT: Government moves Exhibit 3, Your Honor.

23 MS. KLOET: No objection, Your Honor.

24 THE COURT: It's admitted.

25 BY MR. PRESANT:

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 Q Can we start at the top with your education.

2 A Yes. I have a master's degree in biology from Southern  
3 Illinois University in Edwardsville, Illinois and I have a  
4 bachelor's degree in marine science and biology with minors in  
5 chemistry and environmental science from the University of  
6 Tampa in Tampa, Florida.

7 Q Can we back out and go to experience. What has your work  
8 experience been, Ms. Smith?

9 A I was previously employed before I came to Michigan State  
10 Police with the St. Louis Metropolitan Police Department. And  
11 the formal title there was I was a criminalist for  
12 approximately two years.

13 Q What type of work did you do in St. Louis?

14 A I did both body fluid identification analysis as well as  
15 DNA analysis.

16 Q And after you left St. Louis?

17 A When I left St. Louis in March I moved to Michigan and I  
18 became a DNA analyst with the Michigan State Police where I  
19 also perform body fluid identification as well as DNA analysis.

20 Q You've been there more than ten years now?

21 A Yes.

22 Q Are you trained in using STRmix?

23 A I am.

24 Q What trainings have you gone through in STRmix?

25 A I was a member of the first group that was put through the

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 STRmix training in March of 2015 where I underwent the four-day  
2 class with Dr. Buckleton. And then as part of the validation  
3 myself and that original group compiled samples for our  
4 technical leader at the time, Mr. Nye, and went through those  
5 samples and ran a number of samples for practice with STRmix.  
6 And then after we ran through the samples and the validation  
7 was complete, we went through and did a competency test  
8 involving samples that Mr. Nye had created. And then once that  
9 was complete, we then took a written test before we were able  
10 to be put online.

11 Q Page 2, please. And if we zoom in here. Is that the  
12 STRmix training you just testified about?

13 A Yes.

14 Q That's in the middle of a number of other trainings related  
15 to DNA analysis and other forensic topics?

16 A Yes.

17 Q And the trainings you have undergone continue to the end of  
18 your CV as well, right?

19 A Yes.

20 Q Approximately how many samples, DNA samples of any kind do  
21 you think you've processed in your career as a forensic  
22 analyst?

23 A Thousands.

24 Q How many STRmix analyses have you conducted?

25 A Analyses, well over 200 analyses with the cases being

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1 around 200 as well.

2 Q How many times have you testified with respect to any type  
3 of forensic DNA science, approximately?

4 A With testimony, this is my 74th time.

5 Q And how about testimonies including STRmix?

6 A With STRmix, I have testified 16 times.

7 Q Those were all in state court here in Michigan?

8 A Yes.

9 MR. PRESANT: Your Honor, the government offers  
10 Ms. Smith as an expert in forensic DNA analysis.

11 MS. KLOET: No objection.

12 BY MR. PRESANT:

13 Q The Court has already heard Mr. Nye describe the general  
14 process for forensic DNA analysis at the Michigan State Police  
15 lab. You were in the courtroom for that testimony, correct?

16 A Yes.

17 Q Is there anything you would like to add or supplement that  
18 you think the Court should know about the general process from  
19 the time the evidence comes into the lab until the time you  
20 produce your lab report?

21 A As it pertains to STRmix?

22 Q As it pertains to the processing of evidence, or to STRmix,  
23 just anything you would like to add about the general process  
24 before we talk about what you did in this case.

25 A At this time, not all of the analysts in my unit or across



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1 the state are trained in STRmix. However, they are trained in  
2 DNA analysis and mixture interpretation. So because they are  
3 not trained in producing statistics on their mixtures, a lot of  
4 the samples especially at this time in Lansing there were only  
5 two of us that were performing STRmix analysis.

6 THE COURT: Does the Michigan State Police still do  
7 DNA analysis under the pre probability genotyping?

8 THE WITNESS: Yes. The process is the same and if the  
9 analyst that is running their case develops single source  
10 samples they will still produce their report that has a random  
11 match statistics. It's only when the statistic becomes too  
12 complex for mixtures samples that they are then inserted  
13 through the STRmix samples.

14 THE COURT: How is that determined?

15 THE WITNESS: So once the analyst runs their sample  
16 and they see that they have a mixture sample, they then forward  
17 their sample to a qualified STRmix analyst and get approval and  
18 clarification for this sample if it will fit the guidelines for  
19 STRmix analysis.

20 THE COURT: So when you say a mixture sample, you mean  
21 that it appears that there's more than one donor to the DNA  
22 that's being tested?

23 THE WITNESS: Yes.

24 THE COURT: Okay.

25 THE WITNESS: So once, in this case anyway, the

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1 analyst developed her profiles and then sent those forward to  
2 the two of us at the time to evaluate for potential STRmix  
3 analysis. And that still goes on until all of us in the unit  
4 will be qualified.

5 BY MR. PRESANT:

6 Q So there were in this particular case there are actually  
7 three forensic scientists that handled the sample in the lab?

8 A The actual DNA process there were only two. There was the  
9 person that, the person that -- the way our laboratory works is  
10 we do perform our own lab work on our own cases and then  
11 generate reports. However, the analyst that did her lab work  
12 and got, she did issue a report but she could not issue the  
13 statistic on the report because the sample needed a mixture  
14 statistic. So at that time she issued a report that I believe  
15 basically said it's a mixture, a subsequent report will follow  
16 with statistics.

17 Q I missed a question earlier too. You testified you  
18 underwent proficiency testing in STRmix, right, and you  
19 continue to undergo it as long as you are a STRmix analyst?

20 A Yes.

21 Q Have you ever failed a proficiency test?

22 A Not to my knowledge.

23 Q Other general background questions. What type of genetic  
24 analyzer is in use at the Michigan State Police lab?

25 A Right now we have a 3500 XL, which is a genetic analyzer

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 that will inject 24 samples at a time, as well as a regular  
2 3500 which only injects 8 samples at a time.

3 Q And what sort of software is used to interpret the  
4 electropherogram?

5 A GeneMapper is the name of the software that is used to  
6 generate our electropherograms.

7 Q Then STRmix is used to interpret it.

8 A STRmix is the statistical tool used to generate the  
9 statistics.

10 Q All right. So let's take a look at Government's Exhibits 6  
11 and 7. Can we do a side-by-side? They will be in the book in  
12 front of you if you want to flip back and forth but we will  
13 start side-by-side. And would you describe for the Court what  
14 6 and 7 are, if you recognize them?

15 A 6 are the electropherograms that were generated by the  
16 original analyst in the case. Her electropherograms are  
17 utilized to help determine number of contributors. And these  
18 electropherograms have filters turned on which are the stutter  
19 filters which is an artifact that is generated during the  
20 process. Our laboratory has thresholds for each location that  
21 we test that has stutter filters. So in order for  
22 interpretation, if they are below those filters it's  
23 automatically filtered out by our GeneMapper software.

24 And for number 7, I actually have to analyze and  
25 insert the electropherogram into STRmix with stutter filters

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1 off. Meaning that all of the artifacts are present on the  
2 electropherograms and that is so that STRmix can analyze the  
3 sample and determine the probability that this peak is a true  
4 artifact or could it possibly be a potential type.

5 BY MR. PRESANT:

6 Q Those are your initials at the top of 7, ALS?

7 A Yes.

8 Q That's how you know it's yours?

9 A Yes.

10 MR. PRESANT: Your Honor, the government moves to  
11 admit 6 and 7.

12 MS. KLOET: No objection.

13 THE COURT: Admitted.

14 BY MR. PRESANT:

15 Q So would you briefly walk through 6 and 7, the process of  
16 interpretation as you understand that was undertaken by  
17 Ms. Urka was the original analyst, correct?

18 A Yes.

19 Q How it was transferred over to you and then we will look  
20 through your notes in Government's Exhibit 7.

21 A So there are different sets of protocols that different  
22 analysts follow. So non STRmix qualified analysts follow  
23 Section 2.10 in the protocols and they had different rules  
24 according to those protocols. And then once the samples come  
25 forward to STRmix, I have a different set of protocols I follow

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1 which is 2.11.

2 So under 2.10, the analyst looks at their data and  
3 make sure it's free of any extraneous artifacts which are  
4 generally determined to be off ladders at samples, and those  
5 samples can generate off ladders if there's oversaturation  
6 observed. However --

7 THE COURT: What does that mean, oversaturation?

8 THE WITNESS: Oversaturation is when there is too much  
9 DNA amplified on the first go around, and that it will generate  
10 a bunch of noise that is usually detected below the analytical  
11 threshold. So when you have a sample that generates a bunch of  
12 excessive plus 4 stutter, or OLs which are called off ladders,  
13 means they don't have types, you generally will reinject that  
14 sample at a lower time or you will reamplify it with a lesser  
15 amount.

16 THE COURT: Okay.

17 MR. PRESANT: Can I just interrupt? Can we go to page  
18 5 of Exhibit 7? No need for side-by-side. And zoom in right  
19 here. Ms. Smith, would you continue if you would answering the  
20 Court's question regarding oversaturation as we look at the D8  
21 locus.

22 THE WITNESS: Yes. So regarding D8, according to the  
23 manual that Ms. Urka followed, there was nothing wrong with the  
24 data that was detected in D8. Because Ms. Urka is not yet  
25 trained in the STRmix evaluation of the software, she does not

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1 know to look at certain areas more in-depth that I look at when  
2 it comes to the analyses. So being that this 13 type at D8 was  
3 very high, it was under the parameters for oversaturation  
4 regarding STRmix, which is 25,000 RFU, and this is at 23,821,  
5 but however there is a potential plus 4 stutter with the 14  
6 present at 910, which I believe was about three and a half  
7 percent of the 13 type. And in addition to that, the 12 peak  
8 before 13 was in the stutter position for the 13.

9 And I was unaware if the 11 peak that popped up when  
10 the stutter filters were removed could possibly be an N minus 8  
11 stutter which could be artifact generated from the height of  
12 the 13 peak or if it was a byproduct of the 12 peak which could  
13 have been very high stutter.

14 So since the version of software with STRmix that we  
15 use at 2.307 does not model plus 4 stutter, or N minus 8  
16 stutter, it was my judgment call to remove the locus completely  
17 from interpretation as because I could not explain if those  
18 were artifacts or if those were real types. Generally when I  
19 run my own data I like my types to be around 20,000. When I  
20 run my own data I like my types to be around 20,000 at the  
21 highest just because that generally does not indicate an  
22 overexaggerated plus 4 stutter from that highest peak. And it  
23 does not usually generate anything that will go into another  
24 color. So that's just a personal preference. That I start to  
25 see more artifacts once I see that 20,000 peak height.

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1 BY MR. PRESANT:

2 Q Now, you talked about what you prefer for your own types  
3 when you're running the sample, correct?

4 A Yes.

5 Q And so one question that might come to mind is why not just  
6 rerun the sample in this case?

7 A Well, this case was generated under a different protocol  
8 which was 2.10, the original data that was run by Ms. Urka.  
9 Ms. Urka followed her protocol as she was supposed to. There  
10 is no upper bound or upper threshold when it does come to  
11 following a 2.10 manual. So when Ms. Urka ran her data it did  
12 undergo a technical review as well as an administrative review  
13 by two other individuals in the laboratory. Her data was then  
14 approved and reported out in her original report following 210.  
15 So when that data is supplemented over to me, I am taking data  
16 that's already been approved and data that's already been  
17 reviewed and passed through. So at that point I do not have  
18 the ability to reamplify or rerun or reinject a sample because  
19 that's not my data. That's someone else's data. And if on her  
20 review the person that reviewed it thought it should have been  
21 injected or use a lesser injection time, they would have  
22 suggested at that time. But because it did not technically  
23 violate the protocol that she was following, this data was  
24 acceptable for the purposes of her report.

25 Q Let's go back to Exhibit 11 previously admitted. You

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1 recognize 11 as the policy manual for MSP, Ms. Smith?

2 A Yes.

3 Q And can we go to page 88 of the document? Now, we are in  
4 part of the 2.10 series you've testified about, right?

5 A I cannot -- that's actually regarding the analytical  
6 threshold. It says, "All available loci and alleles greater  
7 than or equal to the 250 RFU analytical threshold should be  
8 analyzed or should be utilized during STR interpretation. It  
9 should be noted that peaks not represented by an allele do not  
10 need to be included within the interpretation."

11 Q Can we back out of that please, Ms. Miller, and go to the  
12 bottom here. What's the significance of this, Section 2.10?

13 A This basically says that the single donor reference samples  
14 must also surpass the 250 RFU analytical threshold and that a  
15 known sample that has a single type present at a location must  
16 meet the 900 RFU threshold to be utilized in a statistic.

17 Q Let's jump ahead to page 106. I'm sorry. We have to start  
18 at the bottom, 105. And now we are in the 2.11 series of the  
19 manual, is that right?

20 A I'm not sure.

21 Q We can go to the next page if you want to see the next.

22 A Yes.

23 Q What does the 2.11 series govern exactly?

24 A 2.11 is a protocol that if I were running my own data  
25 through and following forward through the STRmix procedure,



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1 this was the protocol I would follow, as well as if STRmix is  
2 to be utilized in a sample, this is also the protocol you  
3 follow.

4 Q The point is these protocols, dozens of pages in this  
5 particular area of this hundreds of pages document limit the  
6 judgment calls you can make with respect to what you do in  
7 processing the DNA sample and in using STRmix, is that right?

8 A Yes. If I did not generate the data, I can only assess how  
9 the data is once I receive it.

10 Q And the policy allows you to disregard a locus that is  
11 deemed to be oversaturated?

12 A Yes.

13 Q Is that based in part on the detection of the instrument?

14 A It is as well as my training and the ability to determine  
15 artifacts and actually how well or if the software is able to  
16 assess the potential artifact present.

17 Q Let's go to page 3 of Exhibit 7 where we were before. Zoom  
18 in on the note. This note appears on several pages of the  
19 report, is that right, Ms. Smith?

20 A Yes.

21 Q Or of the electropherograms, rather?

22 A Yes.

23 Q Would you just read the note for us?

24 A So I'm required as part of my protocol to document my  
25 number of contributors as well as how I got to that number of

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1 contributors. So this note is me saying that I interpreted  
2 this sample, "assuming that there were three donors present due  
3 to more than four peaks that were observed at multiple  
4 locations, and since D8 exhibited oversaturation and was the  
5 only locus to indicate four potential donors, due to the  
6 oversaturation and possible artifact observed, D8 was not used  
7 in the analysis." So this is my evaluation of the profile as a  
8 whole and how I deemed the profile to be three donors.

9 Q How common is it in your experience to observe a profile  
10 where you have to ignore a locus because it's oversaturated?

11 A At this point it's not uncommon. Again, it's because all  
12 of us are not STRmix trained and so I am receiving data that's  
13 run by someone else. And because that someone else follows a  
14 different protocol, and meets the standards and guidelines in  
15 their protocol, it's not uncommon for me to receive an  
16 electropherogram that may have demonstrated oversaturation.  
17 There also potentially may be a time where I myself may have a  
18 sample that does surpass the 25,000 RFU cutoff, however, if you  
19 look further out in the profile as a whole I may be losing  
20 minor contributors. And so it may be more beneficial for me to  
21 sacrifice one locus that exceeds the threshold in order to gain  
22 more information from additional contributors.

23 Q Let's say you were wrong about the oversaturation and it's  
24 actually a four-person mixture. Would you be willing to run  
25 STRmix again assuming the four-person mixture?

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1 A Yes. My report does offer and say that I will run a sample  
2 again if there are different circumstances that people would  
3 like me to consider. In fact I have on I believe on at least  
4 three occasions that I can recall.

5 Q So if the defense asked you to rerun STRmix assuming four  
6 contributors, that is something you would be willing to do?

7 A Yes. Although I do feel this is a three contributor  
8 sample, I will run it however I am requested to rerun a sample.

9 Q As you sit on the witness stand today, have you received a  
10 request from anyone to rerun STRmix in this case using  
11 different assumptions?

12 A I have not.

13 Q So let's go to Exhibit 9, please. Do you recognize  
14 Exhibit 9?

15 A 9 is the report that I generated based on my STRmix  
16 analysis.

17 Q It's a minor point, but this Exhibit Number 5 in the bottom  
18 right-hand corner, that's not part of your report usually,  
19 right?

20 A Right.

21 Q I'll represent to you that's just the way it was processed  
22 en route to me. That's why it's on there.

23 But so this is your report, and let's go down to your  
24 conclusion section. Mr. Nye testified about the importance of  
25 formulating hypotheses and using that to run STRmix; is that

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 what you've documented here in the report?

2 A Yes. The first interpretation under number 1 I am required  
3 to state how I interpreted the sample, and so I am saying by  
4 looking at the evidence I ran the sample assuming there were  
5 three individuals. Based on our reporting formats, I also have  
6 to state my hypotheses which is generally the person of  
7 interest and two unrelated, unknown contributors, or did this  
8 sample generate from three unrelated, unknown contributors, not  
9 the person of interest.

10 Q And your conclusion was?

11 A The conclusion is, "Based on the DNA typing results  
12 obtained, it is at least 49 Million times more likely if the  
13 observed profile from the swabs of the textured areas of  
14 GUN-001 originated from Daniel Gissantaner and two unrelated,  
15 unknown contributors than if the data originated from three  
16 unrelated, unknown individuals."

17 MR. PRESANT: Your Honor, the government moves  
18 Exhibit 9.

19 THE COURT: Ms. Kloet.

20 MS. KLOET: No objection, Your Honor.

21 THE COURT: It's entered.

22 MR. PRESANT: Let's go to the second page. We have  
23 already heard testimony about the verbal scale table, correct,  
24 and you just applied that to the number you reached at the top  
25 of the page, is that right?

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1 THE WITNESS: Yes. As part of our reporting format I  
2 am required to insert a verbal equivalent to insert the number  
3 in lay terms. And this number corresponded with the 10,000 and  
4 greater part of the equivalent which was very strong support  
5 that Daniel Gissantaner is a contributor to the DNA profile  
6 developed from the swabs of the textured area of GUN-001.

7 BY MR. PRESANT:

8 Q In this first paragraph here under remarks is the offer you  
9 were talking about earlier where you wrote, if other  
10 propositions should be considered you would be able to  
11 undertake them if instructed with sufficient time, right?

12 A Yes.

13 Q Okay. Let's go to Exhibit 8, please. Do you recognize 8,  
14 Ms. Smith?

15 A I do.

16 Q What is it?

17 A 8 is the Word Pad file of the comparison report that was  
18 run against the deconvolution file for this case. So this is  
19 basically an unpretty version of a comparison of the known  
20 sample which was 2AX compared to the evidence sample.

21 Q All right. And let's look at 25, please. What's 25?

22 A 25 is the original deconvolution file that I ran as it  
23 pertained to the gun evidence. And this file gives the summary  
24 of my parameters that I ran as well as the diagnostic kickouts  
25 and the summary of contributors. It also includes the required

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 parameters that are used in the software as well as the allele  
2 calls that were imported into the software and all the genotype  
3 contributor possibility breakdowns.

4 Q Would it be easier if we talked about what led to the 49  
5 million to 1 number to use this Exhibit 25 as the prettier  
6 version of Exhibit 8 or are they different?

7 A This is not the prettier version. The prettier version is  
8 27 or 26.

9 Q I'm sorry. I appreciate the correction very much. Let's  
10 look at 26 then. And would you just lay a little bit of  
11 foundation beyond the prettier version?

12 A So 26 is the PDF form of the Word Pad version that we  
13 previously looked at, and this basically says the same  
14 information, however, it's in table format and it's a lot  
15 easier to follow.

16 MR. PRESANT: Your Honor, the government moves to  
17 admit 8, 25 and 26.

18 THE COURT: Ms. Kloet.

19 MS. KLOET: No objection, Your Honor.

20 THE COURT: They are admitted.

21 MR. PRESANT: Let's start where we are with 26. And  
22 let's go to page 3, please. Zoom in on this area if we can.  
23 So you may recall some testimony from a prior witness where we  
24 were looking at these rows where there is no data entered.

25 THE WITNESS: Yes.

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1 BY MR. PRESANT:

2 Q Would you explain why there is no data in those rows?

3 A There is no data at DY because we don't use DY as part of  
4 the comparison. Not only with STRmix but with any of our  
5 statistics we do not use DY. There's no data at D8 because I  
6 removed that locus from the original deconvolution file so  
7 because there was no information there for the known sample to  
8 be compared to, is why that's blank. Because there is no LR  
9 that can be generated because there was no data for that to be  
10 compared.

11 Q Can we back out of that, Ms. Miller? Briefly go to the  
12 top, just the column headers. Ms. Smith, would you orient the  
13 Court to what each of these three major columns are?

14 A These columns generate the values that were obtained from  
15 the three population data bases that we use, and in Michigan we  
16 primarily only report out the African American, Caucasian and  
17 Hispanic profiles because those are the races most commonly  
18 come across in Michigan.

19 Q Can we back out of that, please? Now, why did you choose  
20 to report -- well let's go to the bottom here, the total  
21 likelihood ratios. Let me word it this way. Is the reason you  
22 chose to report out the 49 million to 1 number because you had  
23 been given information that the defendant in this case, the  
24 known sample is African American?

25 A No. I actually have no idea the race of anyone when I run

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1 the sample. It's the most conservative number out of the three  
2 populations that's generated, so that's the number that's  
3 reported out.

4 Q So if you used the Caucasian data set, the number is even  
5 bigger, the likelihood ratio is bigger, right?

6 A Yes. In our previous or my previous reports and in the  
7 current random match reports, all three numbers for each of the  
8 populations are a given. But because we use STRmix now we just  
9 report out the most conservative number.

10 Q So this E7 means what versus E9 and E8?

11 A So the E7 is the statistic that was generated or the  
12 likelihood ratio that was generated for the African American  
13 population, the E to the 9th is for the Caucasian population,  
14 and the Hispanic was for E8.

15 Q That's just a mathematical notation indicating times ten to  
16 the power of whatever number is listed?

17 A Yes.

18 Q Let me back out, please. Last on this page, just go to the  
19 column. So this 49 million number, you've actually rounded  
20 down to 49 million from what's reported there, right?

21 A Yes. We do only report out two significant figures, so  
22 that's why it's 49.

23 Q That's calculated by all these likelihood ratios from the  
24 individual loci.

25 A Yes.



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1 Q Let's go to the next page, please. Ms. Kloet asked  
2 Dr. Buckleton some questions earlier about these parameters.  
3 Let's look at those briefly. Did you input these settings, the  
4 drop-in cap and the drop-in frequency, this 400 number and the  
5 .453 number?

6 A No, these are parameters that were generated during the  
7 validation process, and this is what all of the samples run  
8 through STRmix are run with. I actually don't have clearance  
9 to alter these samples, or these numbers, and if they were to  
10 be altered, they would be in bold to signify that they were not  
11 the same as the original parameters. However, I do not have  
12 that ability to do that.

13 Q And the next page. Ms. Kloet also highlighted some of  
14 these peak heights. In this column right here that were below  
15 400, that drop-in cap, is that right?

16 A Yes.

17 Q What's the significance of them being below 400?

18 A Really there is not much significance that many of them are  
19 below 400. 400 just happens to be our drop-in cap. Meaning  
20 that if there is a peak that is detected below 400, the software  
21 does consider it to be potential drop-in. However, just  
22 because it's 400 doesn't mean that it's drop-in. The software  
23 also is considering the possibility that it's stutter of some  
24 sort or is it a possible real allele that could be attributed  
25 to a contributor in the case. So it does consider every option

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 and then weighs those options based on the profile as a whole.

2 Q Is there anything else you would like to highlight for the  
3 Court in Exhibit 26 before I turn back to 25?

4 A Just that 26 also has where on page 7, the last page, is  
5 the reference profile from 2AX to show that this is the profile  
6 that was compared to the original evidence. And so this is  
7 also checked on review to make sure that the right profile is  
8 compared to the evidence.

9 Q So it's just listing here the specific alleles at each of  
10 these loci.

11 A Yes. Known samples don't take peak heights into  
12 consideration so that's why none of them are listed; they only  
13 take the allele types into consideration.

14 Q Let's go to 25, please. We have also heard some testimony  
15 about 25 today. This is a document you produced in the course  
16 of doing the STRmix analysis in this case?

17 A Yes.

18 Q Can we zoom in, Ms. Miller, on that area, please? Now,  
19 there are three contributors listed, based on your  
20 determination that there were three, that STRmix should assume  
21 three contributors, is that right?

22 A Yes. Based on my interpretation of the profile, I believed  
23 that these contributor percentages did represent what I was  
24 observing in the profile as a whole where there was a more  
25 major contributor, as well as a middle contributor, and then

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1 again a minor contributor.

2 Q And you've listed the measured mixture or proportions here,  
3 correct, at 68 percent, 25 percent, and 7 percent.

4 THE COURT: Does the fact that those three numbers add  
5 up to 100 percent confirm that there were three contributors or  
6 not?

7 THE WITNESS: That number, if there were four there,  
8 the percentages would also add up to 100 percent. If there  
9 were two, the percentages --

10 THE COURT: Okay.

11 THE WITNESS: So it's just saying that the percentage  
12 of each individual that contributed to the sample. So the  
13 sample as a whole is 100 percent, and this breaks down what  
14 each contributor approximately contributed.

15 THE COURT: Okay.

16 MR. PRESANT: Do you have an opinion, Ms. Smith, on  
17 which of these three contributors is the defendant, assuming  
18 that he is in fact in the mixture?

19 THE WITNESS: When I did the comparison first, so  
20 before I actually run it through STRmix, I actually look at the  
21 electropherograms not only to determine number of contributors  
22 but I do my own comparison to look to see if I could visually  
23 exclude someone so I don't have to use STRmix. Or I also look  
24 through to see is there drop-out in how does this known sample  
25 look compared to the evidence. So I make a conclusion just

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 like I always have before I run the sample. The sample then is  
2 entered into STRmix and confirms my conclusion if the person is  
3 there or not. And originally when I looked at the  
4 electropherogram, I did associate item 2AX as the most minor  
5 contributor, and STRmix then confirmed my conclusion.

6 BY MR. PRESANT:

7 Q So the sample for comparison, the defendant's sample, you  
8 believe to be the 7 percent, correct?

9 A Yes.

10 Q What about sex, are you able to make a sex determination  
11 with respect to either contributor 1 or contributor 2?

12 A Generally, again looking at the electropherogram as a  
13 whole, I'm able to look at the amelogenin, which is the sex  
14 defining chromosome, and generally if the X is larger in the XY  
15 combination, that may indicate a potential female contributor  
16 is predominantly contributing to this sample, and in this case  
17 there was a significant imbalance with the XY. So based on  
18 looking at the profile, in my opinion the predominant donor was  
19 a female in this case. And I knew at least one of contributor  
20 2 or 3 had to be a male because there was also a Y present as  
21 well as there was a type present at DY, which is also another  
22 male indicator chromosome. So I knew before comparing anything  
23 that there was at least one male present out of this mixture.

24 Q And that male would be the defendant if he is in the  
25 mixture, correct?

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 A Yes.

2 Q And your opinion then with respect to contributor 1 is that  
3 that's likely a female?

4 A In my opinion, yes, contributor 1 is predominantly the  
5 female.

6 Q And what contributor 2, can you make a conclusion as for  
7 sex for contributor 2?

8 A I would not make a conclusion on contributor 2.

9 Q Now, is this 7 percent number acceptable because of the  
10 internal validation studies showing STRmix can be used in the  
11 Michigan State Police laboratory down to levels where the minor  
12 contributor is below 7 percent?

13 A Yes.

14 Q There's also been testimony today about this number right  
15 here, the Gelman-Rubin conversions diagnostic. Do you recall  
16 hearing that testimony? You were in the courtroom, right?

17 A Yes.

18 Q Why did you settle on a run of STRmix where this diagnostic  
19 was 1.41?

20 A So according to the 2.11 protocol there are diagnostics  
21 that you look at. The primary diagnostic isn't always is the  
22 contributor percentages does it appear to make sense as well as  
23 the genotype breakdowns. The secondary diagnostics that are to  
24 be considered is the Gelman-Rubin convergence, as well as  
25 allele and stutter variance, and the average likelihood or

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1 average log likelihood. Those numbers aren't the end all be  
2 all and they are to be considered as a whole, and our manual  
3 does say that 1.2 is generally an indicative indication that  
4 the chains did converge. However, being that is slightly above  
5 1.2, is not a big deal because the ultimate is does the weight  
6 of the breakdown of the evidence make sense, and then once the  
7 comparison was run, does the individual likelihoods at each  
8 location make sense.

9 So just because one diagnostic is slightly out it  
10 doesn't cancel the other 7 or 8 diagnostics that you look at.  
11 I have actually had a run where the Gelman-Rubin was at 3.87  
12 but the overall breakdown and likelihood ratios made sense and  
13 it was because of the other minor donor that slightly elevated  
14 it, but overall the run made sense so it was able to be  
15 reported out.

16 THE COURT: When you say made sense, what, is that a  
17 subjective determination by the analyst?

18 THE WITNESS: Yes. Made sense in a term that it did  
19 what I expected it to do. So if in this run say with the  
20 contributor proportions there, it would have said that  
21 contributors 2 and 3 both generated around 15 percent, and then  
22 contributor 1 generated 7 percent or 70 percent. That  
23 breakdown would not have made sense to me because I can tell by  
24 looking at the electropherogram that there is a major, a mid  
25 contributor, as well as a minor contributor. So when I say

## AMBER SMITH - DIRECT EXAMINATION - MR. PRESANT

1 made sense, it means that it made sense with what I was  
2 observing in the electropherogram. And once I did the  
3 comparison, and based on looking at the individual LRs at each  
4 individual locus, those numbers weren't anywhere outside of the  
5 scope that I would have expected them to be.

6 BY MR. PRESANT:

7 Q Is there anything else you would like to highlight for the  
8 Court in Government's Exhibit 25?

9 A Just again that the evidence input file does represent the  
10 stutter filters off and that all those numbers are checked by a  
11 technical reviewer to make sure they were inputted correctly  
12 and that there is data present where there should be data  
13 present.

14 THE COURT: And I think we are going to wrap it up  
15 there, Mr. Presant.

16 MR. PRESANT: Your Honor, if I may I may have one or  
17 two more questions then I'm done with my direct.

18 THE COURT: Okay.

19 MR. PRESANT: Thank you. Ms. Smith, in your career as  
20 a forensic DNA analyst, have you testified of likelihood ratios  
21 before?

22 THE WITNESS: I have.

23 BY MR. PRESANT:

24 Q How long have you been testifying to likelihood ratios?

25 A I have been a forensic scientist for 12 plus years, and I

1 used likelihood ratios in St. Louis, so I have been testifying  
2 and running them since 2006.

3 MR. PRESANT: That's all I have, Your Honor.

4 THE COURT: Thank you. You may step down right now,  
5 Ms. Smith. We are going to have to invite you back tomorrow  
6 for cross-examination.

7 Counsel, what I would like to do before we adjourn is  
8 to go through the, to make sure we have the exhibits correctly,  
9 which ones have been offered and admitted, and I'm going to ask  
10 the clerk to read her list off and once she's finished with  
11 that, would you please indicate whether you have anything  
12 different from what she has.

13 THE LAW CLERK: Do you want the ones, just the ones  
14 admitted?

15 THE COURT: Yes.

16 THE LAW CLERK: Okay. Those are for the government,  
17 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 23, 25,  
18 26, 27, and 28.

19 THE COURT: Is that what you have, Mr. Presant?

20 MR. PRESANT: That's what I have, Your Honor.

21 THE COURT: Thank you.

22 THE LAW CLERK: And for the defense I have G and CC.

23 MS. KLOET: Yes, Your Honor. And just to make the  
24 record clear, the Defense Exhibit F that Your Honor hesitated  
25 to admit I believe has now been admitted through the



1 Government's Exhibit 8. Government's Exhibit 8. So that issue  
2 is resolved.

3 THE COURT: Thank you. Is there anything else we need  
4 to cover before we adjourn for the day?

5 MR. PRESANT: Not from the government.

6 MS. KLOET: Give me one second, Your Honor. Just give  
7 me a second to -- I think we are all set. Thank you.

8 THE COURT: Let's be back here ready to start promptly  
9 at 9:00 o'clock tomorrow morning.

10 THE LAW CLERK: All rise. Court is adjourned.

11 (Proceedings concluded, 4:34 p.m.)  
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## REPORTER'S CERTIFICATE

I, Kathy J. Anderson, Official Court Reporter for the United States District Court for the Western District of Michigan, appointed pursuant to the provisions of Title 28, United States Code, Section 753, do hereby certify that the foregoing is a full, true and correct transcript of the proceedings had in the within entitled and numbered cause on the date hereinbefore set forth; and I do further certify that the foregoing transcript has been prepared by me or under my direction.

/s/ Kathy J. Anderson

Kathy J. Anderson, RPR, FCRR

U.S. District Court Reporter

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